THE

Tea Research Institute

OF

Ceylon

BULLETIN No. 35

Annual Report for the Year

1953

Published by
THE TEA RESEARCH INSTITUTE OF CEYLON
ST. COOMBS, TALAWAKELLE, CEYLON.
1954.

COMMONWEALTH MYCOLOGICAL INSTITUTE
4 NOV 1954

The Tea Research Institute of Ceylon

STAFF

Director	...	J. Lamb, M.Sc., (Lond.), F.R.I.C., A.I.C.T.A.
Chemical Division		
Biochemist	...	J. Lamb, M.Sc., (Lond.), F.R.I.C., A.I.C.T.A.
Agricultural Chemist	...	J. A. H. Tolhurst, B.Sc., (Reading).
Technologist	...	E. L. Keegel.
Research Assistant to Biochemist	...	M. S. Ramaswamy, B.Sc., (Mysore), A.R.I.C., A.I.I.Sc.
Assistants	...	E. N. Perera, V. Mendis & S. M. Gunaratnam.
Plant Physiology Department		
Plant Physiologist & Deputy Director	...	G. B. Portsmouth, B.Sc., (Lond.), A.R.C.S., D.I.C.
Research Assistant	...	F. H. Kehl.
Assistants	...	M. Piyasena & E. S. Rajiah.
Pathology Department		
Pathologist	...	C. A. Loos, F.L.S., M.I. Biol.
Mycologist	...	B. N. Webster, M.A., (Cantab.), M.Sc., (Nottm.), M. I. Biol.
Assistant Pathologist	...	G. D. Austin
Assistants	...	D. J. W. Ranaweera, J. V. Sabanayagam & M. K. Vythialingam.
Engineering Department		
Engineer	...	J. Landreth, A.M.I.B.A.E., Member A.S.A.E.
St. Coombs Estate		
Superintendent	...	E. S. Rose
Low-Country Sub-Station		
Scientific Officer	...	T. E. Walter, B.Sc., (Edin.).
Assistant	...	F. P. Jayawardana.
Administration		
Secretary	...	G. A. D. Kehl.
Secretary to the Director	...	A. C. Perera.
Asst. Secretary/Librarian	...	G. Mason, B. A. (Lond.).
Accounts Clerk	...	A. H. B. Dias.
Stenographers	...	F. G. D. Sielvie & D. C. W. T. Amarasingha.
Assist. Clerks	...	K. A. Salaam & F. N. C. de Silva.
Small Holdings Advisory Service		
Officer-in-Charge	...	R. L. Illankoon.
Tea Small Holdings Officers	...	W. T. Fonseka, K. P. Abeywickreme, M. V. de Silva & K. de A. Kulasekera.

NOTE

The laboratories of the Institute are situated at St. Coombs Estate, Talawakelle, and letters and enquiries should be addressed to the Director, Tea Research Institute of Ceylon, St. Coombs, Talawakelle, Telegraphic Address :—Research, Talawakelle, Telephone, Talawakelle 44 (Private Exchange). It is particularly requested that letters should not be addressed to Officers by name.

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CONTENTS

	Page
28th Annual Report of the Board of the Tea Research Institute of Ceylon for the Year 1953	5
Audited Statement of Accounts and the Balance Sheet for the year 1953	11
Report on St. Coombs Estate for the year 1953	19
Meteorological Observations, St. Coombs, for the year 1953 ...	24
Report of the Director, Tea Research Institute of Ceylon, for the year 1953	25
Report of the Chemical Division for the year 1953	27
Report of the Plant Physiologist for the year 1953	37
Report of the Pathologist for the year 1953	45
Report of the Engineering Department for the year 1953	55
Report of the Scientific Officer, Low-Country Sub-Station for the year 1953	57
Annual Report of the Small Holdings Advisory Service for the year 1953	58

TWENTY-EIGHTH ANNUAL REPORT OF THE BOARD OF THE TEA RESEARCH INSTITUTE OF CEYLON FOR THE YEAR 1953

Foundation.—The Tea Research Institute of Ceylon was established by Ordinance No. 12 of 1925 dated 27th October, 1925.

The personnel constituting the Board of Control is laid down in the above Ordinance, the Tea Research (Amendment) Act No. 24 of 1948 dated 20th December, 1948, and the Tea Research (Amendment) Act No. 51 of 1953, dated 19th December, 1953.

The members of the Board on the 1st day of January, 1953, were :—

Ex-officio Members

The Director of Agriculture (Dr. A. W. R. Joachim, M.B.E.)

The Hon'ble the Minister of Finance (represented by Mr. A. G. Ranasinha, C.M.G., C.B.E., C.C.S., Secretary to the Treasury).

The Chairman, Planters' Association of Ceylon (Mr. W. R. Vander Kiste).

The Chairman, Agency Section, Planters' Association of Ceylon (Mr. W. H. Gourlay).

Representatives of the Planters' Association of Ceylon

Mr. R. C. Scott, Esq., C.B.E.

Mr. H. S. Hurst.

Mr. A. J. Dickson.

Representatives of the Agency Section, Planters' Association of Ceylon

Mr. W. H. Attfield.

Mr. G. K. Newton.

Mr. A. D. McLeod.

Representatives of the Low-Country Products Association

Mr. W. Neal de Alwis, M.P.

Mr. Errol Jayawickreme, J.P., U.M.

Mr. D. E. Hettiarachchi, J.P., U.M.

Representative of Small Holders

Mr. V. G. W. Ratnayake, M.B.E., M.P.

Chairman:	Mr. R. C. Scott, C.B.E.
Secretary:	Mr. J. Lamb, J.P.
Solicitors:	Messrs. Julius & Creasy.
Auditors:	Messrs. Ford, Rhodes, Thornton & Co.
Registered Office:	St. Coombs, Talawakelle.

The following changes in the personnel of the Board were recorded during the year :—

Ex-officio Members.—Mr. C. Dymoke Green, Chairman, Agency Section, Planters' Association of Ceylon, vice Mr. W. H. Gourlay as from 1st March, 1953.

Mr. B. Mahadeva, Tea Controller, assumed a seat on the Board as an ex-officio member following an amendment to the Tea Research Act as from 19th December, 1953.

Representatives of the Planters' Association of Ceylon.—Mr. B. C. V. Weeks (acting) vice Mr. A. J. Dickson (on leave) from 18th April, 1953 to October, 1953.

Mr. H. S. Hurst was renominated as from 21st April, 1953.

Representatives of the Agency Section, Planters' Association of Ceylon.—Mr. G. K. Newton was on leave from 6th January, 1953 to 23rd March, 1953.

Representative of Small Holders.—Mr. V. G. W. Ratnayake, M.B.E., M.P., was renominated for a further period of three years as from 15th October, 1952.

Four meetings of the Board were held during the year viz : on 1st April, 17th July, 30th October, and 11th December. The meeting of 1st April was held at St. Coombs, and the rest in Colombo.

Committees.—*Finance Sub-Committee:* The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.) ; the Chairman, Planters' Association of Ceylon (Mr. W. R. Vander Kiste) ; the Chairman, Agency Section, Planters' Association of Ceylon (Mr. W. H. Gourlay) ; Messrs. A. D. MeLeod, H. S. Hurst, Dr. A. W. R. Joachim, M.B.E., and the Director and Secretary (Mr. J. Lamb).

The following changes in the membership of the Committee were recorded during the year :—

Mr. C. Dymoke Green (Chairman, Agency Section, Planters' Association of Ceylon) vice Mr. W. H. Gourlay as from 1st March, 1953.

One meeting of the Committee was held during the year on the 11th December, 1953.

Special Sub-Committee of the Board.—Mr. R. C. Scott, C.B.E.(Chairman), Dr. A. W. R. Joachim, M.B.E., Messrs. G. K. Newton, Errol Jayawickreme and J. Lamb.

Changes in the personnel of the Committee during the year were :—

Mr. W. H. Gourlay and later Mr. A. D. McLeod acted for Mr. G. K. Newton during his absence from the island on leave.

Mr. A. D. McLeod was appointed a member of the Committee as from 1st April, 1953.

Two meetings of the Committee were held during the year on 26th/27th January, 1953, and 24th March, 1953.

Experimental and Estate Sub-Committee.—Chairman, the Director, Tea Research Institute of Ceylon (Mr. J. Lamb), Mr. R. C. Scott, C.B.E. (Chairman, Tea Research Institute of Ceylon), Mr. G. K. Newton (Visiting Agent, St. Coombs Estate), Mr. F. C. Daniel (Superintendent, St. Coombs Estate), Messrs. S. Bolster, H. S. Hurst, T. Kane, S. P. Vytilingam, M.P., R Leaning, A. J. Dickson, D. E. Hettiarachchi, J.P., U.M., R. J. S. Bean, Mr. B. N. Webster (Mycologist) acted as Convener.

Changes in the personnel of the Committee during the year were :—

Mr. A. J. Pelly Fry (acting) vice Mr. T. Kane as from 5th May, 1953.

Mr. E. S. Rose (Superintendent, St. Coombs Estate) vice Mr. F. C. Daniel (resigned) as from 15th April, 1953.

Mr. B. C. V. Weeks (acting) vice Mr. A. J. Dickson (on leave) from 18th April, to 28th November, 1953.

Mr. S. P. Vytilingam was on leave from 20th April.

Mr. A. S. Hudson (acting) vice Mr. R. Leaning (on leave) from 15th July, 1953.

Mr. A. Watt (acting) vice Mr. R. J. S. Bean (on leave) from 12th December, 1953.

All members of the Institute's Senior Staff were appointed members of the Committee as from 17th July, 1953.

Four meetings of the Committee were held during the year on 19th April, 11th July, 17th October and 27th/28th November, 1953.

Low-Country Sub-Station Sub-Committee.— Messrs. R. C. Scott, C.B.E. (Chairman, Tea Research Institute of Ceylon), V. G. W. Ratnayake, M.B.E., M.P., W. Neal de Alwis, M.P., Dr. A. W. R. Joachim, M.B.E., and J. Lamb (Director, Tea Research Institute of Ceylon).

Passara Sub-Station Sub-Committee.—Messrs. W. R. Vander Kiste (Chairman, Planters' Association of Ceylon), A. J. Dickson and J. Lamb (Director, Tea Research Institute of Ceylon).

A meeting of the Committee was held on 29th January, 1953.

Small Holdings Sub-Committee.—Mr. V. G. W. Ratnayake, M.B.E., M.P. (Chairman), Dr. A. W. R. Joachim, M.B.E., (Director of Agriculture), Mr. W. Neal de Alwis, M.P., Mr. J. Lamb (Director, Tea Research Institute of Ceylon), Mr. R. L. Illankoon (Officer-in-charge, Small Holdings Advisory Service) Convener.

The Committee held four meetings during the year, viz : on 24th February, 17th July, 30th October and 11th December.

Appointments Sub-Committee.—The Chairman of the Board (Mr. R. C. Scott, C.B.E.), The Director of Agriculture (Dr. A. W. R. Joachim, M.B.E.), The Director, Tea Research Institute of Ceylon (Mr. J. Lamb), The Vice-Chancellor of the University of Ceylon (Sir Ivor Jennings, Q.C.) or his nominee and a further member of the Board nominated by the Chairman.

Trustees—T.R.I. Junior Staff Provident Fund.—The Chairman, Tea Research Institute of Ceylon (Mr. R. C. Scott, C.B.E.), The Director, Tea Research Institute of Ceylon (Mr. J. Lamb), Mr. V. G. W. Ratnayake, M.B.E., M.P., representing the Board of the Tea Research Institute of Ceylon, and Mr. E. N. Perera, representing the Junior Staff.

Mr. A. D. McLeod was nominated by the Board to act as a trustee of the Fund as from 1st April, 1953.

One meeting of the trustees was held on 1st April, 1953.

Finance—Cess.—The cess was increased from 30 cents per 100 pounds of tea exported to 55 cents per 100 pounds of tea exported by the Tea Research (Amendment) Act No. 51 of 1953, dated 19th December, 1953.

The year 1953 has been a more successful one as far as finances were concerned than the year preceding it. Total income for the year was Rs. 136,493 more than in 1952. Receipts from cess were Rs. 839,173. Profit from St. Coombs Estate was Rs. 113,765. Interest and other miscellaneous receipts amounted to Rs. 8,423 making the total receipts for the year Rs. 961,361 as against Rs. 824,868.

On the expenditure side Research Revenue Expenditure amounted to Rs. 740,998, interest on the Government Loan Rs. 2,942, and Depreciation Rs. 75,265 making the total for the year Rs. 816,205. There was, therefore, a surplus on working account of Rs. 145,156. This was, however, more than offset by the expenditure incurred on Capital Account which amounted to Rs. 291,061, made up of Repayment of Government Loan Account (final instalment) Rs. 71,392, Buildings and Lines Rs. 52,567, Machinery, Equipment and Furniture Rs. 136,767 and Land Development Rs. 30,335.

After allowing for liabilities on Furlough Pay and Passages Reserve, Small Holdings Advisory Service and Blister Blight Account, net liquid assets at 31st December, 1953, amounted to Rs. 244,889 or 26 per cent. of the total Depreciation Reserve of Rs. 943,461.

The loan of Rs. 1,000,000 obtained from the Government of Ceylon in 1928 was fully settled with the final instalment of Rs. 71,392 paid in September, 1953.

Small Holdings Advisory Service.—Total receipts for the year amounted to Rs. 283,066 as against Rs. 241,038 for 1952. Cess collections yielded Rs. 167,835, the grant from the Institute remained at Rs. 45,000 and the balance carried over from 1952 was Rs. 38,838.

Expenditure for the year totalled Rs. 204,432. There was, therefore, a balance of Rs. 78,635 at the end of the year to be carried forward.

St. Coombs Estate.—The year's working showed a profit of Rs. 113,765, which is the second highest recorded on St. Coombs since 1929, and well over the average of Rs. 47,345 for the twenty-five year period.

Both crop harvested and yield per acre, 277, 183 lb. and 1,014 lb. respectively are the highest recorded so far.

Publications.—Parts I and II of Volume XXIV of the *Tea Quarterly* were combined into a single Conference Number and issued in June. This number, in the main, was a record of the proceedings of the 10th Biennial Conference of

the Tea Research Institute held in March. Part III was published as usual, while Part IV was especially notable by reason of the fact that it included the first colour plates used to illustrate an article in the Institute's journal.

The entire stock of Monograph No. 1 was exhausted during the year, the demand for this work having greatly risen after the Conference. About 150 copies of Monograph No. 2 remain in stock. Receipts from subscriptions and sundry sales amounted to Rs. 3,137, and from advertisements to Rs. 3,580. The total cost of printing and distribution was Rs. 7,374.

Acknowledgments.—The Institute continued to receive the fullest co-operation from the Ceylon Association in London, The Planters' Association of Ceylon, The Agency Section, Planters' Association of Ceylon, and many agency houses, engineering firms and other bodies concerned with the tea industry in Ceylon. The Board is deeply grateful to all the above mentioned for the help and encouragement received from them.

Special thanks are due to the Planters' Association of Ceylon for having at all times during the year placed their meeting room at our disposal for meetings of the Board and its Committees.

Accounts.—Messrs. Ford, Rhodes, Thornton & Company continued to act as our Auditors.

The audited statement of accounts and the Balance Sheet for the year ended 31st December, 1953, are attached to this report. The reports of the Director, and Scientific Staff as well as that of the Superintendent St. Coombs Estate, are also included.

J. LAMB,
Secretary.

Tea Research Institute of Ceylon,
Talawakelle.

THE TEA RESEARCH INSTITUTE OF CEYLON.

BALANCE SHEET AS AT 31st DECEMBER, 1953.

1952 Rs.			Rs. Cts.	Rs. Cts.	1952 Rs.			Rs. Cts.	Rs. Cts.
		LOAN ACCOUNT :—					**FIXED ASSETS :—**		
	1,000,000	Loan from Government of Ceylon	1,000,000.00			2,923,883	Balance as at 31st December, 1952	3,075,381.67	
71,391	928,609	*Less :* Repayment to 31st December, 1953	1,000,000.00			170,565	Additions in 1953	219,670.12	
						3,094,448		3,295,051.79	
		CREDITORS AND PROVISIONS:—			3,075,382	19,066	*Less :* Scrapped and sold in 1953	1,669.35	3,293,382.44
		CREDITORS							
	982	Accrued interest on loan ...	—				**INVESTMENTS AT COST :—**		
	64,336	Sundry creditors—estate ...	49,135.13			20,000	Rs. 20,000 3¼% Ceylon Govt. National Loan 1956	20,000.00	
	52,391	Sundry creditors—research ...	25,761.74			29,512	Rs. 30,000 3½% Ceylon Govt. Loan 1957/62	29,512.50	
		Subscriptions for publications				15,000	Rs. 15,000 3% Ceylon Govt. Loan 1973/78	15,000.00	
	117	(received in advance) ...	384.26			32,435	£ 2,300 3½% War Loan	32,434.76	
		Contributions for cart road				90,000	£ 6,750 2½% National War Bonds 1960/90	90,000.00	
	451	(received in advance) ...	451.00			29,928	£ 2,063–18–1 4% Funding Loan 1960/90	29,928.06	
121,080	2,803	Building contractor	4,521.85	80,253.98	216,875		(Approximate market value Rs. 206,000/-)		216,875.32
		PROVISION FOR FURLOUGH PASSAGES :—					**CURRENT ASSETS :—**		
	49,271	As at 31st December, 1952 ...	64,345.32				DEBTORS		
	40,610	Additions during 1953 ...	60,137.00			67,704	Principal Collector of Customs ...	83,656.04	
	89,881		124,482.32			1,265	Advertising receipts	1,350.00	
64,345	25,536	*Less :* Payments 1953 ...	46,993.89	77,488.43	157,742.41	4,268	Shell Company of Ceylon, Ltd....	—	
						250	Lindoola road upkeep contribution 1953	250.00	
		BLISTER BLIGHT ACCOUNT :—				2,020	St. Coombs Co-operative Stores Society, Ltd.	2,001.00	
	450,000	Contributions received from Tea Controller to 31st December, 1953		600,000.00			Ceylon Planters' Provident		
		Less : Capital account to 31st				1,024	Society	—	
		December, 1953	157,086.47		78,934	2,403	Sundries	3,278.38	90,535.42
69,061	380,939	Revenue account to 31st December, 1953	327,648.31	484,734.78	115,265.22				
		SMALL HOLDINGS ADVISORY SERVICE :—					**DEBTORS—RESEARCH**		
						2,843	Ceylon Association in London (£236-3-7)	3,149.06	
	38,838	Balance as at 31st December, 1952		70,231.67		13,970	Research staff	10,774.59	
	157,200	Appropriation from tea cess				1,672	Accrued interest on investments	1,630.37	
		account, 1953		167,834.72		13,785	Sundries—Estate	7,186.57	
					32,816	546	Debt settlement account ...	2,631.16	25,371.75
325,877	196,038	Carried forward		238,066.39	273,077.63	3,404,007	Carried forward		115,907.17	3,510,257.76

THE TEA RESEARCH INSTITUTE OF CEYLON.

BALANCE SHEET AS AT 31st DECEMBER, 1953.—(*contd.*)

1952 Rs.			Rs. Cts.	Rs. Cts.	1952 Rs.			Rs. Cts.	Rs. Cts.	Rs. Cts.
325,877	196,038	Brought forward	238,066.39	273,007.63	3,404.007		Brought forward		115,907.17	3,510,257.76
	45,000	Special contribution by Tea Research Institute of Ceylon—1953	45,000.00			20,933	STOCKS General	19,791.99		
	241,038		283,066.39			11,454	Electrical	5,585.20		
70,232	170,806	*Less :* Remittances and disbursements 1953	204,431.61	78,634.78		42,599	Tea (39,250 lb.) at prices since realised	92,173.21		
						1,301	ESTATE Foodstuffs 582.93			
		DEPRECIATION PROVISION :—				7,892	Packing materials 3,363.59			
	802,760	At 31st December, 1952 ...	868,195.92		84,188	9	Postage stamps 2.78	3,949.30	121,499.70	
	57,986	Additions during 1953 ...	75,264.85							
	860,746		943,460.77			75,000	CASH On fixed deposit	—		
868,196	7,450	*Add :* Profit on items sold in 1952	—	943,460.77		141,680	On current account with National Bank of India, Ltd. ...	131,917.06		
						1,249	Petty cash	955.50		
		SURPLUS ACCOUNT :—				16	Postage stamps	20.55		
	2,361,934	Balance as at 31st December, 1252	2,449,655.25			192	Postal franker account ...	230.54		
2,449,655	87,721	*Add :* Excess of income over expenditure in 1953	145,155.91	2,594,811.16		218,137		133,123.65		
							ESTATE At National Bank of India Ltd.,			
						6,462	Colombo	8,925.74		
						284	In hand	175.32		
						162	Low-country Sub-station-in hand	—		
					225,070	25	Passara Sub-station-in hand ...	25.00	142,249.71	379,656.58
					695		SUSPENSE ACCOUNT		—	
3,713,960				Rs. 3,889,914.34	3,713,960					Rs. 3,889,914.34

We have examined the above balance sheet with the books of the Tea Research Institute of Ceylon and St. Coombs Estate and have obtained all the information and explanations we have required. Expenditure on blister blight account, whether capital or revenue, has been charged to expense account on the instructions of the director. Subject to this remark, in our opinion the foregoing balance sheet is properly drawn up so as to exhibit a true and correct view of the financial affairs of the Institute as at 31st December, 1953, according to the best of our information and the explanations given to us and as shown by the books.

(Signed) FORD, RHODES, THORNTON & Co.,
Chartered Accountants.

Colombo, 12th June, 1954.

THE TEA RESEARCH INSTITUTE OF CEYLON.

CAPITAL EXPENDITURE ACCOUNT AS AT 31st DECEMBER, 1953

		As at 31-12-52	Additions in 1953	Items scrapped and sold	As at 31-12-53
		Rs. Cts.	Rs. Cts.	Rs. Cts.	Rs. Cts.
Land Including Development Water Supply Rs. 393.50, New Clearing Rs. 29,942.00	...	999,709.73	30,335.50	—	1,030,045.23
Library—Shelving	...	1,093.37	—	—	1,093.37
Buildings and Lines	...	1,557,454.85	52,567.30	—	1,610,022.15
Furniture and Equipment	...	134,590.83	119,511.97	1,669.35	252,433.45
Laboratory Equipment	...	64,038.58	12,246.20	—	76,284.78
Experimental Machinery	...	40,703.70	3,266.40	—	43,970.10
Motor Road Roller	...	7,386.03	—	—	7,386.03
Motor Car	...	9,995.00	—	—	9,995.00
Machinery—Estate	...	156,492.47	—	—	156,492.47
Hoist	...	2,055.38	—	—	2,055.38
Station Wagon	...	11,500.00	—	—	11,500.00
Atco Motor Mower	...	650.00	—	—	650.00
Low-Country Sub-Station	...	83,536.04	—	—	83,536.04
Grubber	...	2,534.77	—	—	2,534.77
Trailer Cap	...	3,640.92	—	—	3,640.92
Covered Leaf Trailer	...	—	1,742.75	—	1,742.75
		Rs. 3,075,381.67	Rs. 219,670.12	Rs. 1,669.35	Rs. 3,293,382.44

THE TEA RESEARCH INSTITUTE OF CEYLON.

ESTATE WORKING ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953.

1952 Rs.	EXPENDITURE	Rs. Cts.	Rs. Cts.	1952 Rs.	INCOME		Rs. Cts.	Rs. Cts.
	Estate Expenditure—Revenue				Tea Sales—Gross Proceeds			
89,991	General charges	104,811.14		509,702	Colombo	266,534 lbs.	554,448.41	
109,052	Upkeep	104,273.55		2,173	Local	961 lbs.	1,794.08	
61,664	Cultivation	45,636.60		3,825	Broken mixed	7,593 lbs.	4,236.50	
112,079	Harvesting	106,034.77		521	Biochemical department ...	309 lbs.	600.12	
105,841	Manufacture	84,540.82	445,296.88	—	Gratis	1,786 lbs.	—	
7,115	Colombo brokerage & handling charges ...		8,209.85			277,183 lbs.		561,079.11
203*	Motor road roller working		1,023.78					
516,221 30,682	Balance carried down		113,764.57		Profit on sale of Guatemala grass			7,215.97
Rs. 516,221			Rs. 568,295.08	516,221				Rs. 568,295.08

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953

1952 Rs.		Rs. Cts.	Rs. Cts.	1952 Rs.		Rs. Cts.	Rs. Cts.
	Administration of the Board			30,682	Balance brought down		113,764.57
240	Planters' Association of Ceylon	240.00			Tea cess	1,007,008.29	
5,162	Travelling of the Board	7,372.85		786,005	*Less:* Credited to Small Holdings Advisory Service	167,834.72	839,173.57
—	Secretary	8,411.00					
32,858	Assistant staff administration	30,006.57		7,083	Interest		6,921.15
1,478	Telephone operators	1,392.00		600	Rent of caddy		600.00
1,477	Office peons	1,745.76		244	Guest house account		52.50
1,196	Postages	1,703.45		254	Miscellaneous receipts		849.35
2,629	Stationery	2,884.37					
1,040	Telegrams and trunk calls	1,137.01					
420	Printing	202.95					
210	Legal fees	36.75					
2,676	Auditors' fees and expenses	4,331.99					
363	Contingencies	359.50					
49,749	Carried forward	59,824.20		824,868	Carried forward		961,361.14

* Credit

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953.—*(contd.)*

1952 Rs.			Rs. Cts.	Rs. Cts.	1952 Rs.		Rs. Cts.
	49,749	Brought forward	59,824.20		824,868	Brought forward	961,361.14
	16,994	Dearness allowance	18,721.61				
	14	Advertising	10.50				
67,588	831	Servants allowance	838.29	79,394.60			
		PERSONAL EMOLUMENTS OF SCIENTIFIC STAFF					
	30,000	Director	30,000.00				
	13,000	Mycologist	14,650.00				
	17,798	Agricultural Chemist	15,371.02				
	24,330	Plant Physiologist and Deputy Director ...	24,050.00				
	8,612	Technologist	9,752.00				
	17,175	Pathologist	16,650.00				
	17,020	Scientific Officer, car and St. Coombs allowance	7,152.77				
	5,000	Proportion of Superintendent's salary ...	4,583.26				
	32,403	Dearness allowance	25,307.39				
	8,034	Servants allowance	7,275.30				
174,378	1,006	Allowance to Acting-Director	—	154,791.74			
		EMOLUMENTS—JUNIOR AND SUB-SCIENTIFIC STAFF					
	59,471	Junior scientific staff	65,278.34				
	11,319	Laboratory attendants	11,823.01				
104,129	33,339	Dearness allowance	35,704.29	112,805.64			
		LABORATORY					
	13,384	Equipment and general working expenses ...	23,362.17				
13,384	—	Furniture and office equipment	5.00	23,367.17			
		LIBRARY AND PUBLICATIONS					
	5,596	Library	4,664.33				
14,790	9,194	Publications	667.37	5,331.70			
374,269				375,690.85	824,868	Carried forward	961,361.14

THE TEA RESEARCH INSTITUTE OF CEYLON.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953.—(*contd.*)

1952 Rs.			Rs. Cts.	Rs. Cts.	1952 Rs.
374,269		Brought forward		375,690.85	824,868
		Small Holdings Advisory Service			
45,000		Contributions for working expenses for the year		45,000.00	
		Field and Factory Experiments			
	11,874	Agricultural Chemist	11,731.64		
	6,333	Plant Physiologist	9,301.14		
	—	Mycologist	930.48		
	5,246	Miscellaneous field experiments	4,495.05		
	10,353	Factory experiments	13,332.48		
36,800	2,994	Low-country Sub-station	4,566.15	44,356.94	
		Travelling of Staff			
	6,856	Officers expenses	8,030.43		
	623	Insurance of car and licence	717.33		
	2,080	Drivers wages	2,176.00		
	818	Drivers batta	704.59		
	10,111	Running expenses and repairs	13,026.68		
22,893	2,405	Dearness allowance	2,497.55	27,152.58	
		Maintenance of Buildings			
	1,199	Laboratory	5,966.49		
	3,351	Senior staff bungalows	4,910.02		
	4,763	Junior staff bungalows	2,313.54		
	902	Clerks bungalows	1,012.70		
	873	Miscellaneous lines & buildings	4,773.40		
	15	Passara buildings	559.63		
	514	Guest house	1,080.17		
	—	Caddy	499.75		
12,521	904	Low-country Sub-station	1,252.26	22,367.96	
491,483		Carried forward		514,568.33	824,868

Rs. Cts.	
961,361.14	Brought forward
961,361.14	Carried forward

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953—(*contd.*)

1952 Rs.			Rs. Cts.	Rs. Cts.	1952 Rs.
491,483		Brought forward		514,568.33	824,868
		General Services			
	21,914	Electric power	14,847.72		
	2,330	Mechanic, Electrician & Fitter	2,450.60		
	1,141	Telephone rent & maintenance of lines ...	3,117.46		
	9,242	Roads	8,445.00		
	4,843	Sanitation	6,098.73		
	2,838	Water supply	7,078.50		
	939	Tappal lorry & book fees	1,108.12		
	4,569	Upkeep of grounds	8,924.09		
	2,162	Guest house	2,925.44		
	1,320	Storekeeper's salary	—		
	13,526	Dearness allowance	12,505.83		
	3,060	Estate staff—1/3rd share of salaries	3,082.50		
74,521	6,637	Labourers holiday pay and medical pay ...	2,235.86	72,819.85	
		Miscellaneous			
	481	Incidentals	374.44		
	17,829	Provident fund—senior scientific staff ...	17,568.95		
	17,726	Provident fund—junior scientific staff ...	19,410.45		
	30,000	Passages provision	53,057.00		
	700	Ceylon Nursing Association, Fraser Home etc. ...	600.00		
	1,302	Medical fees—sub-staff	1,669.57		
	1,605	Medical scheme—junior staff	1,910.00		
	7,937	Insurances	7,669.76		
	5,813	Watchmen and caretakers	4,542.59		
	625	Observatory allowance	600.00		
	5,465	Holiday warrants	4,856.07		
	2,300	Proportion of Superintendent's furlough and passage	2,360.00		
566,004		Carried forward		587,388.18	824,868

		Rs. Cts.
	Brought forward	961,361.14
	Carried forward	Rs. 961,361.14

THE TEA RESEARCH INSTITUTE OF CEYLON.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st DECEMBER, 1953.—(*contd.*)

1952 Rs.			Rs. Cts.	Rs. Cts.
566,004		Brought forward		587,388.18
		MISCELLANEOUS (Contd.)		
	750	Junior Staff Association	1,039.71	
	1,509	Medical scheme—senior staff	5,756.28	
	—	Conference	2,742.06	
94,042	—	Furniture and equipment written off ...	1,067.55	125,224.43
10,680		LOW-COUNTRY SUB-STATION		8,432.81
6,718		GOVERNMENT OF CEYLON LOAN—INTEREST ...		2,942.57
1,717		COLOMBO PLAN EXHIBITION		—
—		FACTORY		16,952.39
57,986		DEPRECIATION		75,264.85
87,721		Balance being excess of income over expenditure for the year ended 31st December, 1953		145,155.91
824,868				Rs. 961,361.14

1952 Rs.		Rs. Cts.
824,868	Brought forward	961,361.14
		Rs. 961,361.14

REPORT ON ST. COOMBS ESTATE FOR THE YEAR 1953

Staff.—Mr. F. C. Daniel left St. Coombs in February. Mr. E. S. Rose assumed duties as Superintendent on the 15th April, 1953, relieving Mr. B. D. Garnier who acted from 1st March.

Mr. B. Asirvadem—Field Assistant—left on the 31st December, 1953.

Acreage.

	A	R	P
Tea in bearing	273	1	00
New Clearing	18	1	28
Green Manure clearing	12	0	00
Land fit to open in tea	5	3	00
Buildings and Gardens	45	2	11
Fuel Clearings	36	3	14
Waste Land and Ravines	32	0	24
	423	3	37

Weather.—(Estate gauge).

	Rainfall Inches	*Wet Days*	*Sunshine Hours*
Registered in 1953	75.74	199	1948
Registered in 1952	113.53	238	1817
Average (Decennial 1944-1953)	89.24	228	1908

The rainfall for the year was the lowest recorded since 1945. Early in the year dry weather was experienced particularly in February, but conditions improved until May, when a severe drought occurred. The rainfall figure for May was .52″ which is the lowest figure on record for that month based on figures recorded since 1929. Subsequent climatic conditions were favourable to good quick growth.

Crop.

	1953 lb.	1952 lb.
Estimate	260,000	220,000
Total Crop (Including Broken Mixed)	277,183	267,974
Yield per acre on 281½ acres	—	952
Yield per acre on 273¼ acres	1,014	—

The very satisfactory increase in crop is attributed to closer plucking rounds with greater attention being paid to the standard of plucking, resulting in green leaf of a good quality being received at the factory, with corresponding fall in off grades and waste tea. This year a much higher percentage of made tea to green leaf was maintained.

The highest yielding field gave 1428 lb. per acre in its third year from pruning.

Prices & Total Crop Sold.

Year	*Total crop sold lb.*	*Gross price cents*	*Nett Price cents*
1953	275,397	203.73	200.76
1952	266,446	193.74	190.92

Prices realised to June, 1953, averaged 183.21 cts. per lb. against the Colombo market average of 210.00 cts. for the same period, the difference at that time being 26.79 cts. per lb. below the average. By the end of 1953 the total average for the year showed 200.00 cts. per lb., the difference being only 6.00 cts. per lb. This indicates that the sales for the latter part of the year have been considerably higher than the Colombo market average.

Cost of Production.

	1953 *Cost per lb.*	1952 *Cost per lb.*
Estimate	170.06	202.57
Actual	160.65	178.61

Dearness allowances included in the above was :—

	1953	1952
Senior and subordinate staff	3.40	3.73
Factory staff	1.90	1.82
Factory labour } Other labour }	34.62	37.71
	39.92	43.26

Profit on Estate Working.

1953 ... Rs. 113,764.57
1952 ... Rs. 30,682.13

Capital Expenditure.

1953	Rs. 37,970.31	13.70 cts. per lb.
1952	Rs. 36,888.00	13.69 cts. per lb.

The expenditure here was :—

Buildings—2 cottage type lines	Rs. 6,285.56
New clearing (No. 1 & 10 fields)	Rs. 29,942.00
New leaf trailer	Rs. 1,742.75

Plucking.—The standard of plucking improved considerably, despite heavy crop intake. Rounds were maintained at 7 to 8 days and the standard of leaf brought in improved considerably with the shortening of the plucking rounds. A noticeable point of these shortened rounds was the fact that the intake of leaf per day became much more even, instead of large variations in quantity from day to day. Individual row plucking was introduced in the new fields, but had to be discontinued due to uneven distribution of new field pluckers to T.R.I. work. This difficulty has been overcome now and individual row plucking will be restarted in 1954.

Pests and Diseases.—With the coming of the S.W. monsoon, blister blight spraying commenced throughout the whole estate, but protection was not as satisfactory as expected. This was mainly due to faulty equipment which had been used consistently for over four years both on St. Coombs estate and on loan to other estates. It was, therefore, decided to purchase

new spraying equipment which proved to be the answer to satisfactory control. No further trouble was experienced. Double boom jet nozzles were used with the new equipment and proved to be both satisfactory and economical. The pruned and unsprayed area in No. 8 field gave startling evidence of the seriousness of the blister attack and confirmed that the standard of control achieved in the sprayed areas was most satisfactory. Loranthus creeper was in evidence in considerable quantities on nearly all the grevilleas on the estate and was satisfactorily removed. Old poria infested areas received attention where necessary but there did not appear to be any new outbreaks of this disease. Mite attacks caused defoliation in No. 11 and 14A fields, which cleared in the wet weather subsequent to resting the areas effected.

Soil Improvement.—No 7 field was pruned in August and subsequently thatched with Guatemala grass at 7 tons per acre, giving a good thick cover over the soil.

The No. 6 field pitting and thatching experiment continues with each area plucked separately and separate yield figures recorded. To-date there is little to choose between the areas in appearance, each having a very good cover of tea, but the thatched area shows a slight increase in yield over the pitted area.

Artificial Manure Applications.—The system of light forking both rows and applying manure every six months, according to crop harvested for each individual field, was continued, and results proved the efficiency of the system.

The following are details of nitrogen and potash applied to individual fields as T.R.I. 500 mixture :—

Field	*Month*	1951		*Month*	1952		*Month*	1953	
No.	*manured*	*Nit.*	*Pot.*	*manured*	*Nit.*	*Pot.*	*manured*	*Nit.*	*Pot.*
1	May	35	19	May	55	32	June	59	28
	Oct.	55	30	Dec.	36	21	Dec.	53	25
2	April	35	19	Jan.	50	28	June	53	25
	Sept.	35	19	May	69	40	Dec.	43	20
				Nov.	53	30			
3	April	35	19	May	60	35	June	53	25
	Sept.	55	30	Nov.	40	23	Dec.	43	20
4	May	40	23	April	43	24	July	66	31
				Nov.	46	26			
5	August	65	35	April	56	32	Nov.	56	26
				Nov.	43	25			
6				Jan.	50	28	Feb.	56	26
				June	58	33	Sept.	59	28
7	Sept.	65	35	April	63	36	March	40	19
				Sept.	43	25	Dec.	43	20
8	April	40	23	April	69	40	March	43	20
	Sept.	65	35	Sept.	54.5	31	Oct.	53	25
9	June	40	23	June	69	40	Feb.	46	22
	Nov.	40	23				Sept.	63	30
10	April	40	23	June	69	40	Jan.	46	22
	Nov.	40	23				Sept.	69	32
11	Feb.	40	23	Jan.	50	28	Feb.	63	30
				June	58	33	Sept.	69	32
12	July	65	35	Jan.	56	32	March	56	26
				July	49	27	Oct.	56	26
13	July	65	35	Feb.	53	30	March	28	15
				August	60	35	Oct.	40	19
14A	April	35	19	June	69	40	July	66	31
	Oct.	55	30	Dec.	56	32			
14B	April	35	19	June	46	26	July	73	34
	Oct.	55	30	Dec.	53	30			

It will be appreciated that irregularities in application times, varying from 6 to 9 months, are due to unsuitable weather conditions or pruning programmes making applications on the due date uneconomical.

Green Manure and Shade Trees.—Grevilleas, *Albizzia sumatrana* and *Albizzia moluccana*, or dadaps have been planted according to the long term shade tree programme in all fields pruned during 1953. All these plants, with the exception of dadaps, were reared in the nursery from seed planted in large supply baskets and appear to have taken very well in all fields.

Guatemala grass was planted as cuttings in No. 3 field, in two plots comprising 1 acre each. One acre was planted in the tea rows and 1 acre in the normal field drains. It is hoped that some information regarding the effect of Guatemala grass on soil and on bushes in mature tea areas will be available once these cuttings have become well established.

Stylosanthes gracilis has been planted on a number of road banks, to act as a cover crop and to prevent wash. It is hoped to propagate further cuttings for use in the new clearings. A bed of *Stylosanthes gracilis* has been planted in the green manure nursery with a view to collecting seed.

Pruning.—A light type of prune has been carried out on the slope of the contour. In all the fields pruned this year the slope was of necessity not perfect, since this is the first time slope pruning has been carried out, and it will take another cycle to bring the bushes into correct condition to obtain a perfect slope without cutting into mature wood. The growth of wood was very good in most fields.

Replanting of Old Tea.—The newly planted area in No. 10 field has now been brought into normal plucking rounds and may be considered to be in bearing. The balance of the cleared area has been terraced on the contour and is now ready for supplying with tea in 1954. The soil structure of this clearing is of an extremely high order, which conclusively confirms the enormous benefit gained by the use of Guatemala grass as a soil rejuvenator.

Uprooting of tea in No. 1 field continued in the early part of the year until the petrol driven grubber became completely unserviceable. It was then decided to investigate the possibility of using some type of tractor driven winch. A few types were tested and eventually it was decided to purchase a trailer type winch in 1954. To the end of the year a total area of 13 acres was uprooted, of which 8 acres will be in a condition suitable for replanting in tea during 1954. The same practice was applied to this clearing as to No. 10 clearing, i.e. Guatemala grass was periodically lopped into trenches on the contour. The root growth of the Guatemala grass formed into a solid mat, completely filling the trenches which had to be re-cut prior to the first lopping of the grass.

Mossing and Ferning.—Once again hand mossing was impossible in the lightly pruned tea. The whole pruned acreage was sprayed with a lime-wash which proved to effectively kill the moss. A small area was sprayed with a local lime product and an adjacent plot was sprayed with an imported lime as an experiment to determine relative efficiency. As reported in the *Tea Quarterly* Volume XXIV, Part IV, December, 1953, the imported product proved to be far superior in every way to lime from local sources.

Fern was removed from the bushes under contract to the estate weeding contractors and now is being removed monthly from all fields by these labourers with a view to reducing fern growth over the whole pruning cycle.

Weeding.—The cost of weeding was rather high last year, mainly due to the fact that a determined effort was made to clean up generally. Many contracts, and in particular the resident Sinhalese contract area, were far from satisfactory, but after a short while the position improved. In view of the excessive cost and poor standard of work done by the Sinhalese contractors, they were ultimately given notice and returned to their village. Most of the weeding is now given out on contract to the resident labour.

Factory and Machinery.—During the year considerable work was done on the factory. The re-roofing and painting was completed and attention was given to factory hygiene. Further work will be needed in 1954, but the general appearance of the factory, both internal and external, has improved considerably. The machinery was carefully checked and repairs effected where necessary.

Mr. J. Landreth, the Engineer, submitted a very comprehensive report on the condition of the machinery which will be dealt with in 1954.

Early in the year the AC motor was installed to drive the DC generator to provide power to the factory through the D.G.E.U., and the cost of engine running, i.e. factory power, was reduced considerably.

Labour.—Labour was found to be adequate for all works including T.R.I. labour requirements. In view of the general improvement in the outturn percentage and the increase in work done per labourer, it is possible that difficulty may be experienced in finding sufficient work for labour in 1954.

General.—St. Coombs estate has responded most satisfactorily to the higher standard of plucking, present method of manure application, lighter style of pruning and clean weeding and now looks most vigorous and healthy. The yield of 1,014 lb. made tea per cultivated acre is undoubtedly the best possible proof of the condition of the estate and of the tea in particular.

E. S. ROSE,
Superintendent.

St. Coombs Estate,
Talawakelle.

METEOROLOGICAL OBSERVATIONS—1953.

ST. COOMBS.

(Laboratory Gauges)

MONTH	TEMPERATURES							RAINFALL		RAINY DAYS		SUN SHINE	
	Mean Maximum	Difference from average (20 years)	Mean Minimum	Difference from average (20 years)	Adopted Mean	Mean on Grass	Mean Relative Humidity	Inches	Difference from average (20 years)	Days	Difference from average (20 years)	Hours	Difference from average (20 years)
January	73.8	— 0.5	55.2	— 0.1	64.5	51.9	73	3.45	+ 0.31	9	0	169.90	— 34.94
February	75.9	— 0.6	54.6	+ 0.2	65.2	48.2	67	1.79	— 0.35	5	— 2	195.38	— 23.67
March	77.8	0	55.9	+ 0.6	66.8	50.9	72	7.14	+ 2.69	14	+ 2	234.33	— 0.28
April	77.6	0	58.1	+ 0.3	67.8	55.5	80	6.13	— 0.19	22	+ 6	168.50	— 35.83
May	79.2	+ 7.5	59.2	— 0.5	69.2	55.3	78	0.43	— 11.25	3	— 16	218.70	+ 53.82
June	74.5	+ 3.7	60.5	+ 0.1	67.5	58.9	84	9.57	— 2.37	17	— 9	137.50	+ 40.57
July	69.0	— 1.1	59.2	— 0.3	64.1	58.9	91	14.79	+ 2.70	30	+ 4	45.63	— 61.73
August	72.3	+ 1.4	59.3	+ 0.1	65.8	59.3	86	5.67	— 4.22	20	— 5	132.40	+ 19.47
September	72.1	0	58.4	+ 0.1	65.2	59.2	85	8.12	— 0.13	22	+ 1	143.43	+ 5.04
October	73.4	+ 0.1	58.4	+ 0.7	65.9	58.0	85	10.29	+ 0.76	26	+ 4	115.27	— 36.64
November	74.4	+ 0.8	55.3	— 2.0	64.8	53.0	77	5.38	— 2.34	11	— 9	207.05	+ 47.77
December	74.0	+ 0.5	57.1	+ 1.0	65.6	53.0	78	5.29	— 0.22	13	— 2	179.50	+ 10.47
	74.5	+ 1.0	57.6	0	66.0	55.2	80	78.05	— 14.61	192	— 26	1947.59	— 15.50
	Means							Totals					

REPORT OF THE DIRECTOR

The reports of the Board and Superintendent, St. Coombs, which precede, and the reports of the staff, which follow this report, give a comprehensive account of the year's activities.

The biennial conference was held in Nuwara Eliya and opened by the Minister of Agriculture, the Hon'ble Sir Oliver Goonetilleke, K.C.M.G., K.B.E., on the 6th March, 1953. As on the previous occasion, the number of requests for invitations to the conference was so large that it was decided to hold a repeat session rather than to seek a hall larger than the Regal Cinema in Nuwara Eliya (which would have meant a move to Kandy or Colombo). Invitations were divided mainly by the choice of invitees, and the proceedings of the first session, held on 6th March, were repeated on 7th March. It was thought that the previous 1949 ' Blister Blight ' conference was a rather special occasion and it was most encouraging to the staff to find equally large numbers wishing to attend the 1953 conference.

Acoustics in the Regal cinema are good, it is most convenient for projection of slides, and all preliminary arrangements are facilitated by its proximity to the Institute. Above all, the size and arrangement of the building is such that a suitable conference atmosphere prevails. In a larger hall all this might be lost, for speakers in the auditorium would find it difficult to make themselves heard and proceedings would be in danger of becoming a performance by the staff of the Tea Research Institute.

During the course of the 1953 conference, attention was drawn to the increased responsibilities of the Institute and to its precarious financial position. Opinions expressed at the conference lent support to a proposal to seek an increase in the tea research cess, and a memorandum on the subject was submitted to the Hon'ble the Minister of Agriculture and Food on 20th May, 1953. The Tea Research Amendment Act increasing the tea research cess from 30 to 55 cents per 100 lb. received assent on the 19th December, 1953.

The already difficult staff position took an acute turn for the worse in the early part of the year. Mr. J. Landreth, Engineer, was forced on account of Mrs. Landreth's ill-health to leave for the United Kingdom by air in October, 1952, at the time when work was commencing on the extensive alterations necessitated by the link up with the national grid. Mr. B. D. Garnier (retired) who was Superintendent of Kataboola Estate at the time of our critical blister blight experiments, came forward, and his offer to act was most gladly accepted. Mr. Garnier commenced duties on the 15th December, 1952. Mr. F. C. Daniel, Superintendent, resigned on the 28th February, 1953, in order to take up another appointment, and again Mr. Garnier relieved a most difficult situation by taking on additional responsibilities.

Mr. E. S. Rose took charge of St. Coombs Estate on 15th April, 1954, and Mr. Landreth returned from leave in early May.

Mr. Garnier rendered invaluable service to the Institute and the Director wishes to record his personal gratitude for the unstinted assistance given by Mr. Garnier through a most trying period.

To the difficulties of this period must be added the vacancy in the post of Agricultural Chemist. The arrival of a newly appointed Agricultural Chemist, Mr. J. A. H. Tolhurst, on the 24th April, 1953, was therefore of especial

importance, apart from interest attached to the application of radio-active tracer technique to some tea problems, for which Mr. Tolhurst had been trained. On the 7th May, two weeks after his arrival in Ceylon, Mr. Tolhurst was stricken with a severe attack of poliomyelitis. Not only was there acute anxiety for Mr. Tolhurst, but for a period it was uncertain whether it was an isolated case or a possible epidemic. All necessary precautions were taken and Mr. Tolhurst was sufficiently recovered to be flown to the United Kingdom on the 6th June, 1954. The Institute is greatly indebted to the Royal Air Force for agreeing to transport the patient in a casualty evacuation craft passing through Ceylon.

1953, however, had its compensations. As already mentioned, the cess was increased before the year was out, and St. Coombs Estate had a most successful year with a record yield of 1,014 lb. per acre. Prices also improved markedly towards the end of the year and the improvement has continued into 1954.

Publications

Portsmouth, G. B.—The control of blister blight disease of tea. *Rep.* XII. *Int. Hort. Congr.* 1218, 1953.

Loos, C. A.— *Meloidogyne brevicauda* n. sp., a cause of root-knot of mature tea in Ceylon. *Proc. Helm. Soc. Wash.* 20, (2) 83, 1953.

REPORT OF THE CHEMICAL DIVISION FOR THE YEAR 1953

General.—Mr. J. A. H. Tolhurst from the staff of Long Ashton Research Station, Bristol, was appointed Agricultural Chemist in the place of Dr. F. Haworth and took up duties on 24th April, 1953. Prior to sailing for Ceylon Mr. Tolhurst attended a course at the Atomic Energy Research Establishment at Harwell in order to receive instruction in the most modern methods of technique involving radio active tracer elements. On May 7th Mr. Tolhurst was stricken with poliomyelitis and was flown back to England on June 6th. By the end of the year he had progressed sufficiently to enable a decision to be made on his future and he hopes to return to Ceylon in the early part of 1954.

The volume of advisory work continues to increase, particularly in connection with manufacturing problems. The Technologist visited 50 factories during the year and reports a marked improvement in the general standard of manufacture primarily due to more interest and attention being paid to factory organisation.

AGRICULTURAL CHEMISTRY

When Mr. Tolhurst was taken ill, the Director, as Biochemist, took direct charge of the Agricultural Chemistry Department. It was considered urgently necessary that work on the nutrition of the tea bush and on tea soils should be given priority. Mr. Ramaswamy, Research Assistant to the Biochemist, was switched, temporarily at least, from work on fermentation of tea to work, also of a biochemical nature, on the nutrition of the tea bush.

Nutrition and Soil Studies. (1) Foliar analysis.—At the time of his resignation Dr. Haworth was engaged on a detailed analysis of young and old leaf from the long-term manurial experiment on No.3 Field. This work was completed ; it involved the determination of nitrogen, phosphorus, potassium, calcium, magnesium and manganese on 324 leaf samples and 54 tipping samples. Detailed examination of the data has yet to be made but there are indications that phosphatic fertilisers used in manuring Ceylon tea may also supply a considerable proportion of the calcium requirements of the crop. Although tea demands an acid soil its requirement for calcium (lime) is apparently quite considerable. The uptake of calcium is closely related to the uptake of potassium and magnesium.

(2) Lysimetry.—To enable a closer study of the uptake of nutrients to be made it was decided to commence lysimetric or drain gauge studies. With the assistance of the Engineering Department two mature bushes of Clone 2024 were isolated on pillars of undisturbed soil and steel containers welded round them *in situ*. They were then undercut and bottoms with piped drainage were welded on to the containers. The two completed lysimeters were then carefully transported to a site near the laboratory and the containers buried to the original soil level and connected by piping to carboys in a trench. Two exactly similar lysimeters were prepared with undisturbed soil adjacent to the sites of the two bushes, i.e. ' controls ' of soil blocks without bushes and these were installed at the same convenient site near the laboratory. The drainage water from all four lysimeters has been

regularly collected, measured and analysed whenever the amount of rainfall has caused the drainage water to flow.

No nitrogen was added to any of the lysimeters, but adequate amounts of other nutrients were supplied. All four lysimeters were given the same treatment.

Table 1. *Analysis of drainage water*

Mineral	Control		Lysimeter with bush	
	No. 1	No. 2	No. 1	No. 2
	(Figures in milligrams)			
Total nitrogen	175.00	206.69	48.72	42.81
Nitrogen as ammonia	24.07	26.62	29.56	23.50
Nitrogen as nitrite	0.21	0.57	0.09	0.08
Nitrogen as nitrate	150.72	179.50	19.07	19.23
Silicon as SiO^2	82.1	60.3	50.4	66.7
Iron as Fe	4.7	8.8	1.8	2.1
Manganese as Mn	1.6	2.0	2.5	3.8
Phosphates	Traces	Traces	Traces	Traces
Calcium as CaO	16.8	14.4	7.7	6.0
Magnesium	Traces	Traces	Traces	Traces
Potassium as K^2O	1.6	4.4	2.7	3.4
	(Figures in millilitres)			
Water	29,330	25,125	13,999	13,330
Percentage recovery of water from rainfall	36	31	17	16

Total rainfall 18.12 inches
No. of days when drainage flowed from all lysimeters 13

It would be unwise at this early stage to draw any conclusions from these figures. Although at first sight it may appear that the bushes have taken up considerable quantities of nitrates, growing plants are suspect of suppressing the process of nitrification. Similar analyses must be carried on for a long period before any significance can be attached to the total losses of minerals.

(3) Soil perfusion.—Stainless steel cylinders, made by the Engineering Department to fit the Hersall Transplanter, were used to remove, relatively intact, 6 inches blocks of soil from the immediate vicinity of the site where the lysimeters were made. Muslin was then tied over the lower ends of the cylinders to prevent loss of soil during perfusion experiments. Water equivalent to an inch of rainfall at each perfusion was added at regular intervals between the 29th September and the 9th October and the drainage collected for analysis. The total perfusion was equivalent to 10 inches of rain and the soil continued to drain freely.

An attempt was then made to wash the soil free of exchangeable ammonia, i.e. the ammonia held by the clay and humus complexes and which is generally thought to be the direct source of nitrate. This was done by cautious addition of normal potassium chloride solution. The reason for caution in this operation was the fear of water-logging the soil. The perfusion with normal potassium chloride solution was followed by water to remove the excess of potassium chloride and was continued until the drainage was free of chlorides. Water-logging was successfully avoided and the operation was completed by the 8th December. The potassium chloride perfusion was carried out with 4 inches of water and the washing with 9 inches.

Table 2. *Analysis of the drainage water*

	Cylinders					
	1	2	3	4	5	6
1. 29th Sept. to 9th Oct. Total ammonia as nitrogen expressed in mgms.	2.96	3.24	2.66	1.19	16.33	11.39
Total nitrate as nitrogen expressed in mgms.	0.0085	0.0037	0.0031	0.0043	0.0028	0.0061
Total nitrate as nitrogen expressed in mgms.	5.75	8.50	8.08	6.24	7.47	5.50
2. 19th Oct. to 8th Dec. Total ammonia as nitrogen expressed in mgms. (exchangeable ammonia)	23.47	21.95	28.01	14.33	18.87	11.16

The results are somewhat erratic ; it was also found that the field from which the soil had been taken had been manured immediately before sampling.

In general, the results agree with the results of other experiments described in this report. The ammonification rate is high and tends to exceed the nitrification rate. Under field conditions the ammonia dissolved from the top layers of soil will be held by the lower layers and sub-soil. Nitrates are not held by the soil and will be lost in drainage water.

The investigation may eventually answer the following questions :—

(*a*) If the tea bush does take up all its nitrogen in the form of nitrate, is the nitrification high enough for optimum growth rates of the tea bushes ?

(*b*) Do any agricultural practices lead to excessive production of nitrate and consequent excessive loss in drainage water ?

It is of interest to examine the figures for exchangeable ammonia (that removed by leaching with potassium chloride) in terms of pounds of sulphate of ammonia per acre. This ammonia is resistant to leaching by rainfall but is available to nitrifying organisms. It constitutes a ' bank deposit on current account ' for the bushes in the vicinity. The average in the six cylinders is equivalent to 102 lb. of sulphate of ammonia per acre. It represents only the top six inches of soil and it is fairly safe to assume that the top eighteen inches of soil in this area have a readily available reserve (resistant to washing out by rainfall) equivalent to 300 lb. sulphate of ammonia or 60 pounds nitrogen.

At the present moment it is difficult to say whether this is good, bad or indifferent. It serves to illustrate some of the practical questions which the investigation is intended to answer.

(4) Nitrogen distribution down the soil profile.—Studies of the nitrogen distribution down the soil profile were commenced in August. In Monograph No. 1 on the work of the Agricultural Chemistry Department of the Institute (page 57) Eden published figures for the nitrogen and organic matter content of St. Coombs Patna soils. Not only are they remarkably high

but there is an apparent tendency to an increase of nitrogen and organic matter in tea soils under cultivation. This finding obviously requires further investigation and the nitrogen status of Ceylon tea soils must, in general, be related to studies on nitrogen nutrition.

It is intended that the investigations shall cover the whole of the tea growing areas in Ceylon. Meanwhile it may be of interest to quote examples of analyses of profiles exposed in virgin jungle, virgin patna and the nearest cultivated fields in the same area.

1. *Mattakelle jungle.*—5,000 *ft. elevation approximately*

Depth	pH	Total nitrogen %	Total carbon %	Parts per million of nitrogen As ammonia	As nitrate
0-6″	4.3	0.47	5.31	9.13	12.97
6-12″	4.3	0.28	2.45	9.92	5.36
12-18″	4.3	0.19	1.63	11.45	3.41
18-24″	4.2	0.15	1.27	11.50	2.80
24-36″	4.3	0.11	0.91	4.15	1.83
36-60″	4.6	0.09	0.56	—	1.82
60-84″	4.7	0.07	0.44	0.84	2.10

2. *St. Coombs No.* 1 *Field adjacent to jungle*

0-6″	4.0	0.27	2.72	8.02	6.34
6-12″	4.1	0.27	2.67	7.95	5.54
12-18″	4.2	0.23	2.11	7.72	13.66
18-24″	4.4	0.18	1.59	7.20	4.64
24-36″	4.3	0.14	1.28	7.30	3.57
36-60″	4.3	0.11	1.04	7.53	3.31
60-84″	4.9	0.09	0.88	7.26	4.76

3. *St Coombs Patna.*—4,500 *ft. elevation approximately*

0-6″	4.6	0.75	11.64	11.43	1.25
6-12″	4.7	0.40	5.68	9.31	1.35
12-18″	4.6	0.18	2.82	—	—
18-24″	4.6	0.12	1.75	—	—
24-36″	4.7	0.07	0.90	6.72	1.60
36-60″	5.0	0.02	0.51	—	—
60-84″	4.7	0.01	0.50	—	—

4. *St. Coombs No.* 10 *Field adjacent to above Patna*

0-6″	4.4	0.36	4.97	9.36	3.0
6-12″	4.6	0.26	3.56	9.22	1.8
12-18″	4.7	0.20	2.56	9.06	1.4
18-24″	4.9	0.12	1.45	8.88	1.5
24-36″	5.7	0.07	0.84	7.16	1.0
36-60″	6.1	0.02	0.42	5.02	1.2
60-84″	5.9	0.02	0.29	3.20	1.1

5. *A 'problem' area*

0-6″	5.2	0.23	3.32	19.07	2.06
6-12″	4.6	0.12	2.34	14.47	1.35
12-18″	4.5	0.10	1.18	10.35	0.62
18-36″	4.7	0.05	0.67	7.67	0.53
36-48″	4.8	0.03	0.64	6.74	0.43
48-66″	4.8	0.02	0.58	8.10	0.40

It would be premature to comment at any length on the results obtained to date. The patna profile is an exceptionally rich one, and it is not intended to suggest that all patna soils are so rich in organic matter and nitrogen as in

the sample given. The figure for carbon content when multiplied by two gives an approximation of the organic matter content. From preliminary figures the patna soils appear to be deeper and richer in organic matter and nitrogen than jungle soils, but the nitrogen is perhaps less readily available. It was evident from examination of the jungle profiles that the jungle species are exceptionally shallow rooted.

The two cultivated fields (Nos. 1 and 10) in which soil examinations have been made are in a high state of fertility. Replanting with clonal material is being carried on in both fields and the young plants are shewing very rapid growth. For comparative purposes it is of interest to give figures for a typical profile in a ' problem ' area at the same elevation as St. Coombs No. 1 Field. In this area growth is extremely poor.

The unusually high ammonia content of all the profiles should be noted, but particularly in the ' problem ' area, where too the nitrate content is lower than in the more vigorous fields.

Taking the above data in conjunction with the indications obtained from the other experiments, there is a strong suggestion that fertility is more directly related to the rate of nitrification than to the rate of ammonification. The investigation will most probably prove a long and tedious undertaking.

BIOCHEMISTRY

Mr. Ramaswamy reports as follows :—

Minor Elements in Tea. (1) Zinc.—Sylvester and Hughes, estimating the zinc content of various foodstuffs, showed that zinc in Indian teas ranged from 25 to 42 parts per million (p.p.m.). It is not clear whether the zinc was originally present in the green tea leaf or whether it arrived in the made tea as contamination from the manufacturing machinery.

Accordingly, analyses were done on green tea flush from several clones grown at St. Coombs, and the results are given in Table 1, as zinc in p.p.m. in the dry weight.

Table 1. *Zinc content of flush from tea clones. St. Coombs*

Clone	Zinc as p.p.m. on dry weight
T. 4	42.4
1294	40.0
2043	31.5
777	26.2
KPW	29.6
960	24.8
34	23.0
2016	33.0
23	39.5
2022	36.6
2024	36.7
2041	36.8
Ken./15/15	26.7
Ken./16/3	33.6
A/O	34.0
S. 123	24.4

It will be seen that the range of zinc is from 23.0 to 42.4 p.p.m., thus corresponding very closely to the figures of Sylvester and Hughes. Four samples of tea dust from a collection in the Technology Department were also analysed, and the results are given in Table 2.

Table 2. *Zinc content of tea dust from various sources.*

Source	Zinc as p.p.m. of dry weight
St Coombs—Up-country	41.0
Deniyaya —Low-country	48.5
India	54.0
Java —Pasir Nangka	66.8

Analyses of zinc in teas of various quality were also done, the results being given in Table 3.

Table 3. *Zinc content in p.p.m. of teas of different quality. St. Coombs.*

Good	Average	Poor
40.0	26.2	31.5
39.5	23.0	29.6
36.6	33.0	24.8
36.7	33.1	
36.8		
Mean—37.9	Mean—28.8	Mean—28.6

It is now generally assumed that zinc is an essential requirement for all higher plants and, although the above work does not prove the essentiality of zinc for tea, the zinc content has been shown to be well within limits found in many other plants.

There is an indication that quality in tea may be correlated with zinc content, but further work is necessary to establish this point.

(2) Molybdenum.—This element has not been detected in the tea flush by the standard chemical procedure.

Molybdenum in green manures.—In view of the fact that certain local soils have been shown to be low in molybdenum for brassica crops, and that this element is closely connected with nitrification in the soil, an experiment was laid down with the two Legumes, Crotalaria and Tephrosia.

Treatments were :—

(*a*) Control. No molybdenum.

(*b*) Molybdenum only. One application of 4 gms of ammonium molybdate dissolved in 1 gallon of water, for every 4 square yards.

(*c*) Molybdenum plus Boron. As under No. 2 with the addition of 4 gms. of borax per gallon.

Boron (B) is occasionally in low supply in local soils.

The content of molybdenum (Mo) as p.p.m. in dry matter of various plant parts as a result of the treatments (*a*), (*b*), and (*c*), is shown in Table 4.

Table 4. *Molybdenum in Green Manures, Crotalaria and Tephrosia. Expressed as p.p.m. Mo. in dry matter*

Green Manure	Crotalaria			Tephrosia		
Treatment No.	1	2	3	1	2	3
Root nodules	6.0	11.8	10.5	2.5	15.5	6.3
Shoot tips 4-6″	0.78	2.60	2.35	0.12	7.84	7.36
Young leaf	0.15	0.80	0.43	0.92	8.24	3.80
Old leaf	0.13	0.35	0.30	0.08	1.26	0.16
Elements applied	—	Mo	Mo+B	—	Mo	Mo+B

Two points of interest arise from these results. The response to added molybdenum is large and rapid, indicating that a practical field control is feasible should the need arise. Boron appears to depress the uptake of molybdenum, but this requires investigation.

The activity of nitrification in legume root nodules is known to be correlated with the molybdenum content over quite a wide range. If some tea growing soils are low in molybdenum, then leguminous trees presumably will not be able to utilise their nitrifying powers to the full.

(3) Manganese.—Some two hundred determinations of manganese have been made on leaf samples from a replicated manurial experiment at St. Coombs. The experiment had not been designed to study manganese problems, but the results suggest that the higher nitrogen applications increased the manganese content of tea leaf. This may be an effect of the manure itself, sulphate of ammonia, rather than the nitrogen as such.

In the mature leaf manganese fell mainly within the range 300 to 600 p.p.m. Mn on dry weight.

In the younger leaf the range was slightly lower, 200-500 p.p.m. Mn.

TECHNOLOGY

Mr. Keegel reports as follows :—

Withering. (1) Mechanical withering.—The withering experiments initiated in 1952 with the object of condensing withering space were continued. Under the conditions of the experiment the conclusions that can be drawn from this work are, broadly speaking, as follows :—

(*a*) Satisfactory withers can be obtained with leaf spread up to a thickness of 12 inches provided it is frequently turned over.

(*b*) For all practical purposes there is no significant difference in the teas from mechanical and tat withering.

(*c*) When quality is present to a marked degree, however, mechanically withered teas do not compare as favourably with those normally withered.

(*d*) During the off quality season extra colour in the liquor balances the slight difference in quality.

The results of the further work carried out on this form of withering thus indicate that, if this process is to prove completely satisfactory, handling of the leaf must be avoided. There remains, therefore, only one method of bringing about an uniform wither and that is reversing of the air flow.

Judging from the data available on the moisture content of the leaf spread at different thicknesses and not turned over, it is very doubtful whether success can be achieved with a spread of over 7 inches.

This rate of spread is roughly equivalent to $2\frac{1}{2}$ pounds of leaf per square foot. Considering that, for the same ground space, a bank of 20 tats can accommodate the same amount of leaf, at a spreading rate of 1 pound per 8 square feet, mechanical withering at normal temperatures has no concrete advantage to offer. Its development, therefore, on a commercial scale is unlikely to be fruitful.

There is also the question of operating such a scheme, which has to be taken into consideration. A current of air has to be maintained for the whole withering period to prevent the undue development of heat in the leaf. Control in such circumstances will undoubtedly necessitate a conditioning plant more elaborate than an ordinary bulking chamber.

(2) Low temperature mechanical withering.—The small scale plant used for the foregoing experiments was adapted for dehumidifying air at a temperature below its dew point. By raising the temperature slightly of this conditioned air to make it capable of absorbing more moisture, work on an interesting line of research in withering was commenced. Temperatures lower than those conventionally employed were obtained and their effect investigated.

Not only was it found possible to get satisfactory withers in a reasonable period at temperatures as low as 50°F, but the resultant teas were also appreciably improved. One striking feature was the marked improvement in the colour of the infused leaf.

These results are consistent with those obtained from the experiments carried out on freezing of leaf, a reference to which work will be found in the annual report for 1943. At the moment they are difficult to assess because true operational costs are not known. With the co-operation of local engineering firms it is hoped in the near future to enlarge the scope of this work. Meantime, further experiments, using the improvised chamber, are to be continued.

(3) Effect of period of wither.—The decline in quality associated with a longer period of wither has been definitely established. Two factors likely to influence the difference in quality between a long period of wither and a shorter one are season and standard of plucking. These were examined individually throughout the year in relation to a 20 hour period and a 10 hour one.

The results may be summarised as under :—

(*a*) When teas are really lacking in quality there is very little to choose between 20 hours and 40 hours.

(*b*) The difference in quality between these two periods is more conspicuous in the quality season.

(*c*) The effect of a longer wither on quality is practically the same with leaf of a fine standard as with coarser leaf.

(*d*) The difference in quality, however, between a good standard of plucking and a poorer standard is greater for a shorter period of wither.

Rolling.—(Trials with Crescent battens).—The unsuitability of this type of batten for the production of large amounts of dhool under moderate pressure has been referred to in the annual report for the year 1948 (Bulletin No. 30). In conjunction with a 35° plain cone, these battens can produce satisfactory dhool out-turns in the later rolls only with heavy pressure, and even then it is not possible to reduce the big bulk out-turn to the figure aimed at on most estates. Accordingly, it was suggested to the makers (Messrs. Walker Sons & Company, Limited.,) that extending the battens to the base of the cone and continuing them along the slope of the cone might improve dhool production. This arrangement was tried out on a 35 inch. Economic roller, but it failed to give the desired results.

With a plain 45° cone, however, dhool outturns of 20 to 25 per cent. were easily obtainable in the first 3 rolls, but a fair amount of pressure was needed to reduce the big bulk outturn to a reasonable figure. With a fade-away arrangement results were almost identical.

The increase in dhool production caused by the steeper cone entirely confirms previous conclusions drawn from small scale experiments on the technicalities of rolling. It is, therefore, clear that if standard Crescent battens are to be adapted for all rolls they should function with a 45° cone. On the evidence available, it can be reasonably inferred that such an arrangement will also suit the other sizes of Economic rollers fitted with Crescent battens.

Rapid Moisture Testers.—Rapid and accurate methods of testing the moisture content of tea have been under consideration for some time past. Most of the moisture meters commonly used for the determination of moisture in granular products do not appear to be suitable for tea as they cannot be relied on to give accurate readings for low moisture contents. Since the orthodox type of apparatus is no longer available, any instrument that is accurate over the range of 1 to 6 per cent. and not too expensive or complicated, will doubtless be a boon to the industry.

The Ridsdale Moisture Teller, one of the instruments recently tested, gives promise of being satisfactory for normal factory requirements. The most suitable temperature and drying period must, however, be determined and the instrument calibrated for the lower moisture contents before being put to use.

Two other rapid moisture testing instruments which are claimed to give very accurate readings are to be tested shortly. One is electrically operated, and the other depends on infra red radiation for its action.

Stalk Extraction. (1) Benville red leaf picker.—This has been in regular use in St. Coombs factory for over 1½ years, and has given satsifactory results. Compared with hand picking, cost is about the same, but the appearance of the teas is better. For good standards of leaf the difference in appearance is not so marked as to affect prices, but the Benville picker should be more

advantageous when dealing with leaf containing a high proportion of ' reds '. For low-country teas, the value of which is to a great extend influenced by appearance, it would be found particularly useful.

Two drawbacks in the unit at St. Coombs are that the nozzles are too small for big bulk and they are also not sufficiently durable. These are being rectified in the later models.

(2) Air floatation.—This is a method successfully employed for the cleaning of such materials as seeds and nuts. A perforated table with a shaking motion, through which a blast of air is blown effects the separation. The possibility of separating stalk from tea on this principle was tested. The experiments were a failure because of the very small difference in size and specific gravity between stalk and leaf.

(3) Electronic separation.—This is another well-known method used for the cleaning of pulses and similar products. The difference in colour between stalk and tea suggested the possibility of the electronic principle being applied for cleaning tea. Unpicked samples were sent to the manufacturers of the machines used in the coffee industry. The experiments were not successful. It was found impossible to sort tea on machines of this type owing to the smallness and light weight of the particles.

Crop Protection Experiments.—The manufacture of leaf from experiments on spraying and dusting carried out by the Pathology Department was continued.

Clonal Manufacture.—62 manufactures of clones were done for 11 estates on 15 separate occasions.

Acknowledgments.—It is a pleasure to acknowledge the assistance from the tea tasters in Colombo and their readiness to report on the numerous experimental teas. The service they have rendered throughout the year is greatly appreciated.

J. LAMB,
Biochemist.

REPORT OF THE PLANT PHYSIOLOGIST FOR THE YEAR 1953

General.—The Plant Physiologist returned from leave in January. The staff of the department has remained unchanged during the year.

583 letters were received and 572 despatched.

27 estate visits were made during the year and 5 Planters' Association meetings attended.

The supplying of No. 10 Field (Clonal area) and planting of part of No. 1 Field with Clone 2024 were carried out under the supervision of the department.

Tea Selection and Vegetative Propagation.—The main clonal area was extended by the addition of 39 new clones. 5 new clones were planted in the Blister Resistant area. Two of these additions appear to be very vigorous and highly resistant to blister blight.

Cuttings of 35 new mother bushes were put out in the nursery. 11 of these mother bushes, selected from the unprotected plot in No. 8 Field, appeared to be highly resistant to blister blight and grew vigorously throughout the south west monsoon. Most of the other cuttings were from outside estates.

Many deaths have periodically occurred among the clones in the old nursery, which is infested with meadow eelworm. None appear to be outstanding.

(1) 1947 Clonal area.—These clones completed their first 3 year cycle in May, when they were pruned to the slope at a height of about 20-24 inches from ground level. It was not possible to extend the cycle to a 4 year one on account of the prolific growth which had been made by most of these clones, since by the end of the third year the bushes had grown to such a height that pluckers found it difficult to remove all flush. No spray protection was given at any time during the cycle. Yields for the 3 year cycle, manufacture results, blister observations and rooting of the better clones are shown in table 1.

Table 1. 1947 *Clonal Area. Yields, manufacture results, rooting and blister observations for first 3 year cycle.*

Clone	CALCULATED YIELDS—LB./ACRE				MANUFACTURE					
	1st Yr. 6/50-6/51	2nd Yr. 6/51-5/52	3rd Yr. 6/52 5/53	Total 120 plucks	No of tests	Above Avg.	Avg.	Below Avg.	Rooting	Blister observations.**
2024	1240	2295	2655	6190	8	6	2	—	V Good	0–1
2025	745	1830	2310	4885	3	1	2	—	Good	1–2
2023	645	1685	2030	4360	3	2	1	—	V Good	2–3
2021	810	1500	1800	4110	4	4	—	—	Good	1–2
2046	595	1485	1980	4060	2	—	—	2	Good	1–2
2022	860	1650	1535	4045	4	2	2	—	Good	0–1
2016	810	1485	1585	3880	4	1	2	1	Good	1–2
2043*	645	1335	1600	3580	3	—	—	3	V Good	0
2026	380	1120	1780	3280	2	—	—	2	Good	2–3

* Red leaf type

** 0—Disease absent
1—Few white blisters on leaves.
2—Many white blisters on leaves
3—Many young stems damaged but not killed throughout.

Clone 2024 has yielded at an annual rate of 2,063 lb. per acre over the full cycle and is undoubtedly an outstanding selection. It is now being planted up extensively on the St. Coombs new clearings.

(2) Blister resistant area.—Most of these clones continue to show a high degree of resistance to blister blight, but the majority are low yielders. The yield distribution for the first full year and for the first 9 months of the plucking in the second year is shown in table 2.

Table 2. *Yield distribution of blister resistant clones*

Yield range lb. per acre	1st year 40 plucks No. of clones	2nd year 30 plucks No. of clones.
100–199	1	3
200–299	5	6
300–399	3	4
400–499	6	6
500–599	12	7
600–699	6	3
700–799	3	4
800–899	3	6
900–999	4	2
1000–1099	4	4
1100–1199	—	—
1200–1299	—	—
1300–1399	—	2
1400–1499	—	1
1500–1599	—	—
1600–1699	—	—
1700–1799	1	—

To date the most promising selections, many of which are from outside estates, appear to be Nos. 2065 and 2086, UR12, OK4, TK48, D1, MT/BG, KEN 15/2, 16/3 and 22/1, KEW 14/1, 4/A2 and 4/A4, S106 and 123, and B8.

(3) Saw dust.—Well broken down saw dust was tried as a rooting medium for nodal cuttings. The pH of the saw dust tested was 5.1. Even after nearly eight months only one out of the 30 cuttings originally put down had rooted, although 25 had very large callus formations, while 4 had died. Saw dust as a medium for rooting tea cuttings is, accordingly, not recommended.

(4) Continuous cloches.—These are extensively used instead of green houses in the United Kingdom by market gardeners to grow certain crops. Each cloche consists of 4 glass sheets (2 12″ × 24″ and 2 12″ × 16″) which are held together by means of specially constructed galvanised frames.

Fifty cuttings of clone 25 were planted under 2 cloches, the undersides of the glass sheets being lime washed before use to prevent scorching. At the end of four months 78 per cent. of the cuttings had taken root and none had died. Under fern only 48 per cent. had struck root. Though results have been very satisfactory these cloches would not appear to be suitable for large scale propagation. Besides being small they are difficult to handle and are easily broken. Furthermore they are costly.

(5) Clonal banji observations.—Data are at present being collected on the banji formation of 33 clones in plucking. Samples of leaf are being analysed at every plucking. The data, besides producing evidence regarding the percentage of banji harvested from individual clones, will also permit an examination of banji fluctuations, if any, due to climatic conditions or

age from pruning. The indications at present are that it is a characteristic of some clones to produce a high percentage of banji.

Green Manures.—Brief notes on the various species of green manure plants which have been under trial on St. Coombs during the past two years are given below. Much of this information was held over from the 1952 report due to lack of space.

(1) Ground covers.—*Aeschynomone americana* Linn. This species of thornless mimosa is a slow grower that does not produce even a fair quantity of leafy material at this elevation. At Peradeniya it is said to grow so vigorously that under favourable weather conditions it can be cut every two months. It is considered to make good hay meal for cattle and poultry.

Alysicarpus vaginalis (L) DC. Asvenna, S. A hardy deep-rooted plant which is rather common among short grass. The numerous prostrate stems extend to about 12 to 15 inches. It forms too dense a mat to be suitable for tea, although it may be useful by edges of banks and drains.

Crotalaria clarkei.—The seed germinates very rapidly. This cover made excellent growth on St. Coombs and has a compact and desirable habit. The many trailing stems that grow from the main root extend to about 18 inches. A thick cover, about 12 to 18 inches high is usually formed in about 9 months. Flowering and seeding takes place in about 4 to 6 months. After seeding the plant sheds most of its old leaves and fresh growth is made, quite unlike other covers tried on St. Coombs. It is susceptible to flea beetle (*Longitarsus sp*) and seedlings attacked by this pest either make slow recovery or do not recover at all. It is being tried out in young tea on a small scale.

Crotalaria retusa Linn.—This is a sturdy bushy type of annual plant with trailing branches, which grows to about 18 inches high. Growth is fair and the quantity of leaf material that is produced is reasonable. It is quite a suitable type of cover and is being tried out in tea. Leaves and pods are susceptible to attack by *Argina* caterpillars.

Desmodium limense var *sandwicense* (E Mey.) Schinde.—A pasture legume that may be a useful cover in areas where better ones fail. Plants are easy to grow and appear to be hardy and to provide a fair quantity of leaf. Has so far been free of disease and pests.

Mimosa invisa inermis.—Seed was obtained from Proefstation der C.P.V., where it is considered to be one of the finest cover crops. This thornless variety of the common sensitive plant is of rapid growth with a suitable habit. It branches freely, forming a good cover in about 4 to 5 months, and produces a good mulch. It is similar in growth to the variety with thorns which was some years ago considered to be a suitable cover.

Ornithopus sativus.—Commonly known as serradella. The stems, which grow to about 2 to 2½ feet, are slender, much branched and semi-erect. The plant appears to be very short-lived and all the sowings on St. Coombs have now died out. Seed is usually inoculated before sowing. Not recommended.

Stylosanthes gracilis. H.B. & K.—This perennial, commonly known as stylo or brazilian lucerne, has proved to be a suitable and efficient cover for tea on St. Coombs as well as on other estates where it is being grown.

This legume seems to flourish from sea level up to about 5,000 feet. It is a vigorous grower and forms a good cover in about 4 to 6 months, depending

on soil and climatic conditions. It produces a large weight of green material and protects the soil efficiently from erosion and insolation.

Unlike many other covers stylo does not climb the tea ; a few shoots may sometimes grow up through the centres of bushes but these can easily be pulled back with a hooked stick.

Another advantage is that the low spreading shoots, which grow to a length of about 3 to 4 feet, do not root at the nodes and so can be easily rolled back for manuring or weeding. During the first year of growth occasional weeding may be necessary but, once a thick cover has been formed, weed growth is to a great extent inhibited. At low and mid elevations it is best grown as a bush cum ground cover, the upright shoots being cut and used as a mulch.

Stylo can be grown from both seed and cuttings. As seed is scarce and growth slow in the first few months, it may be advisable to sow the seed in well-prepared nurseries, small baskets, or soil blocks. When the plants have grown to about 6 inches high they can be planted at a spacing of 8 to 12 inches between the bushes. One ounce of seed contains about 10,000 seeds. Tender cuttings with about 4 nodes root better than woody cuttings.

Stylo was recently found to be very susceptible to root-knot eelworm. This means that where the root knot eelworm is present and can build up it will not be possible to retain a stylo cover permanently. In such cases it will accordingly be necessary to rotate with some other non-susceptible cover.

Stylosanthes sundaica Taub. (*S. mucronata* Willd.).—This annual which is known as Townsville lucerne in Queensland is very much smaller than *S. gracilis*. The prostrate stems grow to only about 10 to 12 inches and form a mat like cover. Plants on St. Coombs died during the south west monsoon and this cover may not therefore be suitable in districts where rainfall is heavy.

Stizolobium aterrimum, Piper and Tracy (=*Mucuna aterrima* Holland).—This plant, commonly known as Mauritius, Bengal or velvet bean, is an extremely vigorous grower which produces a larger mass of growth than most other covers. The vines are slender and grow to about 25 to 35 feet. It is unsuitable in tea on account of its tendency to climb, but may be useful in bare patches or as a ground cover in areas planted with Guatemala grass.

Vigna phaseoloides Bak. aff.—This is a fairly vigorous grower, which forms a dense cover, while the vines show no tendency to climb. It is very susceptible to mite attack—*Tetranychus* sp.

(2) Bush plants. *Desmodium distortum*.—This plant is a rapid grower in the early stages and a fair quantity of leaf is produced before flowering, which takes place in about 5 to 6 months. It then seeds fairly profusely and thereafter makes hardly any growth. The stems are rather woody and its recovery after lopping is slow. It has so far been free of diseases and pests.

Priotropis cytisoides.—This plant, which resembles a crotalaria, grows to a height of about 6 to 8 feet. It has a good branching habit, and produces a fair quantity of leafy material. It was found to be very susceptible to attack by the Ragmus bug (*Ragmus importunitatis*) and flea beetles. One attack was so severe that most of the young plants died. The plants at the Passara sub-station are doing well.

(3) Shade trees. *Crotalaria agathifolia*, Schweinf..—Seed was given to the Director by Mr. E. C. Taylor of Nandi Tea Estates, Kenya. The seed was collected in the Nandi jungle where it was found to be growing wild. The seeds are slow to germinate but, once started, the plant is a quicker grower than most other crotalarias and reaches a height of about 10 to 12 feet in about 12 months. It first branches at about 3 to 4 feet. A heavy canopy of foliage is produced which has so far been free from any pest. It also does not appear to be susceptible to the ' Ceratophorum ' leaf spot disease commonly associated with crotalarias. Little seed is set and the pods are attacked by pod borers. Otherwise a very promising plant.

Derris robusta.—This is a very slow grower on St. Coombs, the plants taking a year to reach a height of 3 feet. It has a very deep tap root. The plant does not appear to be suitable for this elevation.

Indigofera teysmanii, Miq.—This is a very quick growing leguminous tree which was introduced from Indo-China, where it is said to be grown extensively. On St. Coombs the plants grow to about 12 feet high within 12 months, but at lower elevations a height of 20 feet may be reached. It appears to have a good spreading habit. On St. Coombs it has been free from pests and disease. A few plants have been put out in the tea and the growth has so far been satisfactory.

(4) Unsuitable species.—The following green manures were also grown on trial but, due to sparse foliage, undesirable habit, etc. were found to be unsuitable at this elevation :—

Alysicarpus rugosum
Argyrolobium leucophyllum
Crotalaria intermedia
„ *lanceolata*
Lespedeza cuneata
„ *stipulata*
„ *striata*
Pueraria thunbergiana
Sesbania speciosa

Weedkillers.—An experiment to determine the feasibility of periodic applications of the less toxic weedkillers, to control weeds in tea in plucking, was laid down during the year in No. 9 field. Each plot was 1/16th acre in extent and there were 4 replications of each of the following 4 treatments :—

(*a*) Fernoxone (Sodium salt of 2, 4-D), applied at a rate of 2½ lb. in 60 gallons water per acre.

(*b*) Phenoxylene 30 (Sodium salt of MCPA), applied at a rate of 2/3rd gallon in 60 gallons of water per acre.

(*c*) Atlacide (Sodium chlorate), applied at a rate of 15 lb. in 60 gallons water per acre.

(*d*) Control—hand weeding.

About 0.5 per cent. of teepol was added to all the above solutions to increase wetting. Application was in fine weather only by means of knapsack sprayers fitted with low volume nozzles and was, of course, confined only to the areas carrying weed growth.

Very careful supervision proved to be necessary, since careless application can cause considerable damage to the tea itself. Even so it was quite impossible to prevent spray falling on fringe branches.

Preliminary results to date suggest that all three weedkillers are effective against the majority of common broad-leaved weeds growing in tea but that they leave most grasses untouched. The persistent use of such weedkillers may, therefore, be expected to bring about a change in the weed flora.

More weeds appeared to grow in the hand weeded than in the sprayed plots. This is probably due to the scrapers used in hand weeding bringing up viable seeds to a level at which they are able to germinate.

The yields of the various treatments, given in table 3, show no significant differences to date.

Table 3. *Yields from* 23-3-53 *to* 9-12-53 (30 *pluckings*)

TREATMENT	YIELD, lb./acre.
Fernoxone (2, 4-D)	1,015
Phenoxylene 30 (MCPA)	1,004
Atlacide (Sodium chlorate)	1,018
Hand weeded	995

Costs, based on a total of 7 separate applications, are shown in Table 4.

Table 4. *Weedkiller—costs per acre*

Weedicide	Total used	Cost of weedicide Rs.	Cost of Teepol Rs.	Total cost Rs.	Cost per application Rs.
Fernoxone	9.84 lb.	37.60	9.68	47.38	6.75
Phenoxylene 30	11.62 litres	48.55	9.92	58.47	8.35
Atlacide	56.50 lb.	53.72	9.52	63.24	9.03

These figures do not, however, represent the full costs, since the costs of application, about 2 labourers per acre, and the costs of removing grasses by hand from the sprayed plots have still to be added in. Accordingly, when the full costs of these weedkilling treatments are compared with the actual cost of hand weeding of Rs. 11/15 per acre per round (estate estimate Rs. 10/25), it seems unlikely that this method of control will prove economic.

None of the weedkillers tested appeared to have a long period of effectiveness. Furthermore, their use does not permit of the growing of cover crops or bush green manures.

Soil Conditioners.—Tests with three synthetic soil conditioners, currently available in Ceylon, were carried out with a view to determining their suitability for use in V.P. nurseries. The products tested and their methods of application were as under :—

(1) Krilium.—Monsanto Chemical Company. Cost Rs. 20/- per pound from A. Baur & Co., Ltd., pH 4.3. Half a pound was spread dry over 10 sq. feet of bed and then well mixed with the top three inches of soil. The bed was then lightly watered, and left for one day before use.

(2) Aerotil (Dry).—American Cyanamide Company. Approximate cost Rs. 7/- per pound, from Shaw Wallace & Co., Ltd., pH 8.6. Applied as (*a*) above.

(3) Aerotil (Wettable).—American Cyanamide Company. Approximate cost Rs. 4/- per pound from Shaw Wallace & Co., Ltd., pH 7.6. Half a pound was dissolved in one gallon of water and poured over 10 sq. feet of bed. This treatment is mainly intended to control surface crusting.

The soil used was of average tilth with an initial pH value of 4.7. 100 cuttings of clone 25 were planted in each bed and examined for rooting after 6 months. The results are given in table 5.

Table 5. *Effect of soil conditioners on the rooting of clone* 25.

Treatment	Shot & rooted	Rooted, not shot	Total rooted	Not rooted	Dead	Final soil pH
Krilium	58	9	67	30	3	4.6
Aerotil (Dry)	17	10	27	62	11	4.7
Aerotil (Wettable)	10	9	19	56	25	4.6
Control	25	23	48	47	5	4.6

Both forms of Aerotil do not appear to be suitable for tea. Krilium has, however, brought about sufficient improvement to warrant more extended trials, provided that there is some possibility of the price being reduced to a more economic level.

Field Experiments.—Two of our long term field experiments completed cycles during the year. Some of the more interesting results are briefly indicated below :—

(1) The three factor (n.p.k.) manurial experiment.—This experiment actually completed three years of its 7th cycle in November, 1952. It was then given an additional manure application and allowed to run on for a further six months so as to revert to normal pre-blister blight pruning in April, since spray protection is now routine on all experiments.

Yields for the nitrogen and potash treatments, for the first three years of the cycle, have already been published (*Tea Quarterly*, XXIV, Pt. IV, p. 79, Dec. 1953) and will not, therefore, be repeated in this report. It may, however, be noted that the responses to potash manuring continued to increase during the cycle and are now about one-third greater than they were at the end of the 6th cycle (Ann. Rep. for 1949, Bull. 31). A further indication of the increasing importance of potash on this experiment is that the weights of foliage leaf and wood, recorded at pruning, from the K_0 plots are now starting to fall off.

As always, there was once again no response to phosphate manuring above the P30 level. This clearly indicates that 30 lb. of phosphoric acid, when supplied as the freely available superphosphate, is more than enough to meet the requirements of the crop which can be produced in response to the highest levels of nitrogen (80 lb.) and potash (40 lb.) manuring included in the experiment. In T.R.I. 500 mixture, however, phosphoric acid is supplied in the much less freely available form of natural rock phosphate (Saphos) and its proportion in the mixture has, therefore, been increased over that suggested by this experiment to allow for this decreased availability.

(2) The passara manurial experiment.—This experiment also completed its 7th cycle in March. As yields had fallen off badly during this last cycle, plucking was then stopped and the bushes allowed to rest, with extra manure, until they were pruned down in the normal time in early October.

Once again the main results have centred around the depressant effect of phosphate manuring, either alone or in combination with potash. This is not unduly surprising in view of the fact that the levels of phosphate manuring have been about four times as great as are now recommended in relation to the nitrogen and potash treatment levels employed. Over the 19 years of the experiment the phosphoric acid plots must have accordingly received an enormous excess of this nutrient. This is confirmed by the statement made regarding this experiment on page 41 of the 1948 report (Bull. 30) that ' Whatever be the nature of phosphate reversion in the soil, it is such that the plant finds no difficulty in absorbing the nutrient (*phosphoric acid*) and in using it efficiently after nearly four years '.

Accordingly, in order to examine these residual effects of phosphate, all phosphoric acid applications are being omitted during the present cycle, whilst the nitrogen and potash levels are being increased.

(3) Guatemala grass experiment.—Five cuts have now been taken from this experiment. Up to date the main effect that appears to be emerging is a straight line relationship between yield and nitrogen manuring over the full range of 6 different nitrogen levels under test.

Although the grass itself has a very high potash content the responses to potash manuring are so far the lowest of all. This suggests that Guatemala grass may have exceptional foraging ability for this nutrient.

G. B. PORTSMOUTH,
Plant Physiologist.

REPORT OF THE PATHOLOGICAL DIVISION FOR THE YEAR 1953

The Pathologist reports as follows :—

General.—There were no changes in staff. Mr. M. K. Vytilingam was on temporary transfer to Meddecoombra Estate, Watagoda, from 20th April to 30th September as supervisor of the large scale blister blight experiment conducted there by this division.

1,036 letters were received and 1,099 despatched.

399 consignments of specimens were received for disease indentification and report. 181 soil samples were examined for parasitic eelworms.

39 visits were made to estates for disease advisory purposes. It is regretted that many requests for visits had to be refused due to pressure of work.

Blister Blight.—As in the previous year almost the total acreage of tea in Ceylon was under fungicidal protection during the monsoon months. May was a very dry month, most estates recording less than one inch of rain while the latter part of June and short periods in August and September were also rain free. These periods of dry weather caused a welcome delay and set-back in the incidence of blister blight in the south-west monsoon districts.

Crop protection experiments.—(1) st. coombs no. 9 field crop protection experiment was discontinued in December, 1953. The experiment was set up to ascertain the optimum interval required between spraying rounds with a copper fungicide for the effective control of blister blight on tea in plucking. The experiment also afforded valuable data on bush deterioration following blister blight attacks on unprotected tea. Over a $3\frac{1}{2}$ year cycle, on tea pruned for dry weather recovery, unprotected plots showed a loss of approximately 50 per cent. maintenance foliage and wood, and about 33 per cent. crop loss compared with plots protected with a copper fungicide. The full cycle results were published in the 1952 annual report.

(2) No. 3 field crop protection experiment, which was designed to try out fish leaf plucking and periodical resting coupled with fungicidal protection during the resting period, was also terminated at the end of the year. As the cycle progressed it became increasingly difficult to build up a new canopy of maintenance foliage on bushes rested after fish leaf plucking. Production of new growth during the resting periods was so irregular that it entailed fish leaf plucking of shoots, which had already reached the desired plucking table height, and spray protection, for considerable periods, of delayed growth well below the plucking table. Although fish leaf plucking removes blister susceptible leaf before white sporing blisters are formed, the supervision necessary during the formation of a new plucking table makes this method of agricultural control both uneconomic and impracticable under local conditions.

(3) No. 8. field crop protection experiment, details of which have already been published in the *Tea Quarterly*, Vol. 21, pt. 4, December, 1950, pp. 16-21, was pruned in June/July. Plot B (spray protected during both monsoons) and plot C (sprayed during the south-west monsoon only) were sprayed throughout recovery, while plot A received no spray protection.

Plots B & C were tipped on October 3rd, and up to the end of the year, had given 196 and 171 lb. made tea per acre. The unprotected plot A was damaged severely by blister blight with the result that only a small percentage of the bushes were ready for tipping by December 21st i.e. six months after pruning. This experiment will run at least another cycle and will serve as a demonstration plot of the effects of blister blight disease both with and in the absence of spray protection. As plot A is the only area on St. Coombs, and probably in the whole of the Dimbula district, where tea has not received fungicidal protection at one time or another, interesting data should become available of the effect of continued attacks of the blister blight fungus on bush health.

(4) Mattakelle estate dusting experiment.—The efficiency of five proprietary formulations of 4 per cent. copper dust was evaluated on tea in plucking on the Cairness Division of Mattakelle Estate. Two of the formulations, 'Blidust' (Messrs. Pest Control Ltd.) and 'Perecloud' (Messrs. Plant Protection Ltd.) proved to be the best of the dusts tested. The full results of this experiment are being published in the March 1954 issue of the *Tea Quarterly*.

(5) Meddecoombra estate experiment.—This experiment which was over 668 acres of tea on Meddecoombra Estate, Watagoda, commenced on 1st May, and continued until 30th September. Mr. M. K. Vytilingam was transferred to Meddecoombra to supervise and conduct the field trials. The following 3 methods of fungicidal application were tried out :—

(*a*) Mistblowing, through the Duiker Type MAA—1953 mistblower, of an ultra low volume application of 6 ounces copper fungicide in 1 gallon water per acre at 9-10 day intervals.

(*b*) Double nozzle spraying through the Spraying Systems Company's boomjet nozzle fitted with 2 OC-O2 jets on 'Vermorel' pressure-retaining knapsacks. Copper fungicide was applied at 6 ounces in 15 gallons water per acre at 9-10 day intervals.

(*c*) A 4 per cent. copper dust applied through the 'Orient' rotary hand duster at 5 lb. per acre at 5 day intervals.

Frequent breakdowns were experienced with the mistblowers. Fortunately a number of prototype machines were available as standbys. At the termination of the experiment the machines were modified at St. Coombs and loaned for further experimentation to Ragalla Estate. No serious breakdowns were experienced after modification of the machines.

Although efficient protection was afforded by all three methods of application, double nozzle spraying showed the highest degree of protection. Occasional rows or groups of bushes in the mistblown and dusted areas showed a fairly high incidence of blister infection. These bushes had obviously not received effective fungicidal cover due to changes in wind direction at time of application.

A full report on the Meddecoombra and Ragalla trials are being published in a 1954 issue of the *Tea Quarterly*.

Wood rot.—Investigations into the various causes of wood rot of tea bushes were begun, and results will be published later in the *Tea Quarterly*.

Eelworms.—Large numbers of soil samples were received for parasitic eelworm examination. These examinations may serve only a limited purpose

unless there is a previous history of meadow eelworm infestation on the estate. It should be realised that for eelworm examinations only about one quarter of a pound of soil is examined. As this amount is only a minute proportion of soil from an average nursery bed a negative result can be of little value.

Soil fumigation of small areas, like nurseries, is helpful in reducing populations both of eelworm and other injurious soil insects such as wire worms, cut worms, and white grubs. Shell D-D soil fumigant is probably the most efficient of the soil fumigants, but ethylene dibromide has also given satisfactory results. Soils fumigated with ethylene dibromide should not be planted up for at least one month after fumigation to avoid possible phytotoxicity. Ethylene dibromide is obtainable from either Messrs. Mackwoods Limited, or the Shell Company of Ceylon. Methods of soil fumigation have been discussed in the *Tea Quarterly* Vo. XXIV, Part 1 and 2, June 1953, pp. 34-38. A further note on fumigation is being prepared for a later issue of the *Tea Quarterly*.

Fumigation does not alter soil pH. Nevertheless tests for pH are still advisable on new nursery sites and on areas which have been heavily composted, if costly failure of the nursery is to be avoided.

Slugs.—Slugs, causing severe damage to an Albizzia nursery, were effectively controlled by applications of Messrs. Plant Protection Ltd's Metaldehyde concentrate (50 per cent. metaldehyde). The metaldehyde was mixed at $1\frac{3}{4}$ oz. of the concentrate to 15 oz. of a 4 per cent. copper dust. The mixture was applied to the plants fairly heavily by means of a dust gun. For complete control a second application was required 3 weeks later.

Mites.—Tea leaves infested by scarlet mite (*Brevipalpus australis*) and yellow mite (*Hemitarsonemus latus*) have been received fairly frequently for examination and report. A few isolated cases of purple mite (*Calacarus carinatus* Green) and red spider (*Paratetranychus bimaculatus*) attack have also been reported. In one instance red spider caused severe defoliation of a young tea clearing.

Scarlet mite has been known in Ceylon for a considerable period and has apparently grown in importance as a pest in recent years. Scarlet mite is primarily a pest of tea in the 3rd and 4th years in the pruning cycle and on young clearings.

The view has been expressed that the use of residual copper sprays in the control of the blister blight disease of tea has increased the incidence of yellow mite in Ceylon and red spider in South India. This may well be the case if the mites are controlled by a predatory fungus which is copper susceptible as the fungus is destroyed by the fungicide and the mites breed unchecked. However, copper spraying in Ceylon, against the blister blight disease, is carried out during the monsoonal months of May to December and yellow mite attacks occur during the months of February to April during which time little or no spraying is done and the mite susceptible foliage does not usually carry copper residues. If copper fungicides control a pathogenic fungus severe mite attacks should therefore develop during the rainy season and not during periods when no fungicide is applied. There have been instances when fairly severe yellow mite attacks have developed during the inter-monsoonal period but in such cases, as a period of dry weather had intervened, copper spraying had ceased.

In an attempt to determine the effect of weather and/or copper spraying on the incidence of yellow mite the following experiment was laid down on

St. Coombs on tea 3 months from pruning. The experiment consisted of 6 sub-plots, each containing 6 bushes which had previously been infected with yellow mite by introducing heavily infested flush on to the plucking table. Bushes in 3 of the sub-plots were enclosed in jute hessian, which was kept continuously wet to create conditions of high humidity, while the other 3 sub-plots were left under normal field humidity conditions. The sub-plots were treated as follows :—

1. Under normal field humidity conditions. Sprayed at 5 day intervals with a cuprous oxide fungicide.

2. Under normal field humidity conditions. Sprayed at 10 day intervals with a cuprous oxide fungicide.

3. Normal field humidity conditions. Unprotected.

4. Under high humidity conditions. Sprayed at 5 day intervals with a cuprous oxide fungicide.

5. Under high humidity conditions. Sprayed at 10 day intervals with a cuprous oxide fungicide.

6. Under high humidity conditions. Unprotected.

The sprayed plots had applications of a suspension of 4 ounces of a 50 per cent. copper fungicide in 10 gallons water, sufficient to wet the growing flush (yellow mite susceptible material) on both surfaces. The unprotected plots were sprayed with tap water at the same application rate as the copper sprayed plots.

One week after the experiment commenced all plots showed heavy yellow mite infestation which diminished to negligible proportions 3 weeks later due to cessation of flush growth and the material becoming unsuitable to mite attack. Two weeks after the experiment commenced 20 living mites from each treatment were taken daily and placed in drops of water on a glass slide. The slides were left for one week in damp chambers and observations made on fungus growth. The following were the results of an average of 10 examinations (i.e. on 200 mites off each treatment).

Treatment	1	2	3	4	5	6
Average percentage of mites which developed fungus growth	14	16	13	14	13	16

It is apparent that there are no significant differences between the treatments, and that under normal field conditions, the fungus will develop to the same extent whether or not copper spraying has been carried out.

The experiments continued for 3 months but there was no difference in the intensity of attack between treatments. Mites from all treatments, disappeared completely during the prolonged period of rain in April.

Sulphur taints.—Sulphur formulations, applied as sprays or dusts, are an effective means of controlling mites. Sulphur, however, on tea in plucking causes undesirable tainting of the manufactured tea. The wettable powders ' Spersul ', ' Thiovit ' and ' Shell Coloidal Sulphur ', applied at a concentration of 1 lb. in 25 gallons of water, or lime sulphur formulations at a dilution of 1 gallon in 40 gallons water, all applied at about 40 gallons per acre, severely tainted tea plucked one week after application. Tasters were unanimous regarding undesirable tainting of tea plucked 10 days after an

application of sulphur. Three weeks after sulphur applications one taster reported a slight, but noticeable, taint. It is, therefore, advisable to allow a period of 3 weeks to lapse between spraying and plucking if sulphur control of mites is resorted to.

Albizzia mite.—A few estates in the Maskeliya district reported severe defoliation of *Albizzia falcata* Syn. *moluccana* by a scarlet mite which Dr. Edward W. Baker of the U.S.A. Department of Agriculture has kindly identified as *Brevipalpus phoenicis* (Geijskes).

MYCOLOGY

Mr. B. N. Webster reports as follows :—

General.—Mr. H. L. Munasinghe resigned his post as Technical Assistant on August 31st. Mr. J. V. Sabanayagam was appointed as a Temporary Field Assistant on June 13th. He was later appointed Technical Assistant on September 1st.

Dr. W. J. Dowson, sc.d. of the Botany School, Cambridge, visited the Institute in an advisory capacity between 6th February and 21st June. Dr. Dowson took part in the ' Cercosporella ' and Mycorrhiza investigations, and in the isolation of root nodule bacteria from leguminous green manures.

Apart from sharing the correspondence referred to by the Pathologist, 38 visits were made to estates, and addresses given to three district planters' Association Meetings.

Diseases.—There were no reports of unusually serious outbreaks of known diseases during the year, although the flush infection (' corrosion ') symptom, attributed to the ' Cercosporella ' disease was prevalent on many estates in the Dimbula, Maskeliya and Nuwara Eliya districts.

Inadequately treated Poria patches led to extensive removal of bushes on two estates in the Dimbula district, and thorough supervision of Poria control work must again be urged.

(1) 'Cercosporella' disease.—A full investigation of this disease has proved conclusively that of the two symptoms attributed to the fungus *Calonectria theae* Loos, only one, that of mature leaf infection followed by defoliation, is actually caused by this organism.

Acacia decurrens is extremely susceptible to this disease and in periods of wet weather infected Acacia leaflets falling on to the tea beneath, adhere to the leaves. The already strongly growing fungus is able to penetrate the tea leaves, eventually causing large yellow-brown patches, and ultimately resulting in heavy defoliation of diseased leaves. The flush symptom, said to be caused by spore infections, was much more prevalent in dry weather, and repeated attempts at isolation failed to produce any fungus from the bud and young leaf lesions. Taken together, these two facts suggested that a causal organism other than a fungus, was responsible for the symptoms observed.

The marked similarity between this symptom and symptoms of attack by capsid bugs, previously remarked upon by Petch, led to extensive collection of night feeding insects. Collections consisted almost exclusively of a green capsid bug, indentified by the Commonwealth Bureau of Entomology as *Lygus viridanus* Motsch.

A replicated experiment of which full details are to be published elsewhere, was laid down. This included the application of *Lygus* bugs, *Calonectria theae* spores, and other insects to young tea plants. All the plants which received living *Lygus* bugs showed within three weeks extensive damage of buds and young leaves, and, after one month, four of the seven plants in this treatment were also showing typical leaf corrosion following the unfolding of damaged buds.

Having satisfactorily established the bug as the causal organism of the corroded flush condition, a further experiment was laid down to investigate field control measures. Treatments included D.D.T. spraying and seven, ten and sixteen day plucking rounds. The short plucking rounds were included following the discovery of the eggs of the capsid bug in the very young stems of flush shoots. It was hoped that short rounds would result in the removal of eggs before they hatched.

Two months after the commencement of the experiment the following assessments were made :—

Table 1

Treatment	% damaged flush after two months.
50% D.D.T. at 2 lb. per acre. One application.	10
7 day plucking	5
10 day plucking	15
16 day plucking	33

It will be seen that both insecticide application and shortened plucking rounds effected a considerable degree of control. On the estate on which these experiments were done a plucking round of 8 days in all fields materially reduced infestation.

Further details of the investigations, with illustrations, are to be published shortly in the *Tea Quarterly*.

(2) Ganoderma root disease.—Early in the year an estate in Dimbula reported numbers of deaths of tea bushes in an area of approximately four acres. On examination it was found that many large *Albizzia moluccana* stumps in the area, and dead and dying tea bushes around them, were carrying fructifications of a fungus identified as *Ganoderma applanatum* (Pers. ex. Fries) Pat. This fungus, formerly known as *Fomes applanatus*, is usually found growing as a saprophyte on dead stumps. Petch regarded the fungus as a weak parasite, better able to attack already weakened plants than strong and healthy ones. Enquiry revealed that the Albizzias in question had been felled some twelve to eighteen months previously, within a few weeks of having been ring-barked. It was also found that the area in question was heavily infested by meadow-eelworm. In other fields, in which similar Albizzias had been felled, there were no signs of attack on the tea, although the Albizzia stumps were carrying fructifications of *Ganoderma*. It is reasonable to suppose that the fungus which invaded the recently cut tree stumps was able to parasitise only that tea already

weakened by meadow-eelworm. Although there is no direct evidence from Ceylon that ring-barking of shade trees a year or more before felling assists in the prevention of certain root diseases, it should still be carried out as a routine.

(3) Acacia elata disease.—The disease of *Acacia elata* reported in the 1952 Annual Report (Bulletin No. 34) is still prevalent, 131 diseased trees having been removed from the original area in 1953. A fungus, tentatively identified as *Aposphaeria* sp. has been constantly associated with disease lesions and cankers. All attempts to produce artificial infection, using both canker tissue and the fungus, have, however, failed.

(4) 'Amphichaeta' disease of grevillea seedlings.—The fungus *Amphichaeta grevilleae* Loos, previously associated with a disease of seedlings of *Grevillea robusta*, has been conclusively proved to be a facultative parasite of Grevillea seedlings under excessively humid conditions. During a replicated trial on infectivity, damaged tissues were found to facilitate entry of the pathogen to a much greater degree than undamaged tissues.

Control measures were investigated, and a report will be published in a forthcoming issue of the *Tea Quarterly*.

(5) Fungus 'disease' of yellow mite.—Cultures of a fungus isolated from dead yellow-mites were received from the Pathology Section and indentified as *Scopularia* sp. There is as yet no evidence to suggest that this fungus is an active pathogen of yellow-mites, although it is of fairly constant occurrence on dead mites in the field, and on mites which have died in slide humidity chambers in the laboratory.

Field and Plant-House Experiments. Mycorrhiza of tea.—Pot experiments have been laid down with cuttings in the plant-house, to determine the effect of various manurial treatments on tea in the presence and absence of mycorrhiza. Sterilised and unsterilised soils have been used, and certain inoculations of soil from known mycorrhizal root areas have been made. Results are not expected until late in 1954.

Low-country Rhizoctonia Experiment.—Rhizoctonia solani has not yet appeared in any of the experimental plots. Detailed examinations of masses of diseased leaves have shown another fungus, as yet unidentified, to be associated with diseased patches.

Certain of the treatments appear to have been beneficial, but no report is to be issued until the termination of the experiment in 1955.

Fungicide Trials.—Two new dispersible copper fungicides were on trial during the year. Both were in paste form, one based on copper carbonate and one on an oxide of copper.

'Ialine' colloidal copper is a 12.5 per cent. copper fungicide, based on a carbonate of copper. Trials conducted during the North East monsoon of 1952-53 showed that this product gave satisfactory control of blister blight when applied at a rate of 1½ lb. per acre at a cost of Rs. 1/50 for fungicide (Rs. 1/- per pound). Equivalent control was achieved by the use of a 50 per cent. copper fungicide ('Perenox') at a rate of 6 ounces per acre, and at a cost of approximately Rs. 1/- for fungicide. Both concentrations of fungicide used contained 3 ounces metallic copper, and although the finer state of division of 'Ialine' was advanced as a reason for reducing the concentration, this was not borne out by results.

During the South West monsoon further trials were conducted with ' Ialine ' at a concentration of 1 pound in 1½ gallons of water per acre, the fungicide being applied by the ' Duiker ' mist -blower.

Another fungicide ' Kupferpaste 70 ' produced by Messrs. Johanne Schubach & Sohne, was included in the mist-blowing trial, at a concentration of 6 ounces in 1½ gallons of water per acre. Neither of these fungicides gave control comparable to that of ' Perenox ' and no further trials are envisaged.

Further field trials of fungicides will only be undertaken if the products concerned are completely new formulations which show considerable promise of effecting economy in protection.

PASSARA SUB-STATION

Mr. G. D. Austin reports as follows :—

General.—Mr. C. Marudaveeran resigned his post as Field Attendant on 31st December.

Approximately 950 letters were despatched. Many of these were replies to enquiries and comprised lengthy reports on insect pests, diseases, green manures and weeds received for identification.

Thirty-six visits to estates, mainly in Uva, were made in connection with advisory work.

Five demonstrations were held during the year when visitors were given an opportunity to make themselves familiar with the chief insect pests and diseases of tea and green manures, and with the measures to be adopted for their control. More than 70 Superintendents and assistants attended the morning sessions. Afternoon sessions were conducted in both English and Tamil, and the attendance of 45 was limited to conductors and kanakapillais.

Pests. (1) Nettle grub.—Compared with the situation in 1952, when only 4 estates in Uva reported the presence of the pest, 12 estates, some of them large groups, were affected during the year under review. The chief species of nettle grub involved in all reported outbreaks was *Natada nararia*—the fringed nettle grub. The areas attacked were extensive, and the attacks severe enough to cause a certain amout of alarm. In previous years whenever an outbreak of this pest reached serious proportions a virus usually affected the grubs and limited the severity of the attack. It was usually found that, where examination showed that there was 50-60 per cent. infection of wilt, artificial measures of control were unnecessary. In 1953, however, the wilt did not effectively control the outbreak. The pest persisted and subsequent generations were as large, or larger, than the previous ones. The reason for this is not clear, but it was noticed that in 1953, the two braconid parasites *Fornicia ceylonica* and *Rogus* sp., which are usually active parasites of the early generations of nettle grubs before the virus wilt appears, were almost entirely absent. The absence of these parasites in the early generations may have contributed to the much higher build-up of nettle grubs in the later generations, and account for the persistence of the pest.

In spite of the risks involved by the use of D.D.T. which were emphasised by the Director when he addressed the Uva Planters' Association, and by the

officer-in-charge of the sub-station at demonstrations, managers of estates resorted to spraying and dusting with D.D.T. formulations, and these effectively controlled the outbreak.

A few field experiments with the ' Swingfog ' machine, using Dieldrex, Aldrex (two of the newest synthetic chlorinated hydrocarbons), Gammexane and Guesarol, gave negative results against larvae. In a few trials, however, the above mentioned organic insecticides, and even dieseline alone, showed promise as ovicides and as contact sprays against very young natada larvae.

With the co-operation of Dr. Kenneth M. Smith, Director of the Plant Virus Research Unit, Cambridge, experiments have been initiated to determine the possibility of using artificial cultures of wilt disease, now confirmed as a ' granulosis virus disease ', as a means of control of nettle grub.

(2) Shot-hole borer.—In view of the impending changes at the Passara sub-station it was decided to lay down all the extensive field experiments on Galbode Estate, Ratnapura. The experiments briefly are (i) a loss of crop experiment to ascertain the loss, if any, of crop due to shot-hole borer infestation ; (ii) to determine the age of young tea most susceptible to attack ; (iii) the elimination of shot-hole borer in new clearings by the application of sprays at staggered intervals. Messrs. James Finlay & Company, Limited, have afforded the Institute valuable assistance by providing the services of a field assistant to supervise these experiments.

These experiments should provide data which will corroborate, or refute, an observation made during a six month investigation in the Ratnapura district in 1952 ; it was then observed that, though young tea plants in clearings are liable to attack by shot-hole borer when they are 12 to 18 months of age, the beetles only reach the proportion of a *pest* when the tea, which has been centred and pruned, reaches its fourth year from planting and is ready for plucking.

At Passara an experiment was initiated to ascertain the resistance or immunity of certain clones to shot-hole borer.

(3) Miscellaneous insect pests.—The following species of insects were reported during the year to be causing sufficient damage on estates to warrant their being mentioned for purposes of record :—

Toxoptera aurantii Boyer (Aphididae) Tea Aphis
Melanagromyza theae Cotes (Agromyzidae) Tea leaf-miner
Simplicia robustalis Guen. (Noctuidae)
Porthesia (*Euproctis*) *scientillans* Wlk. (Lymantriidae)
Indarbela (*Arbela*) *quadrinotata* Walk. (Cossidea) Bark-eating borer
Actias selene Hb. (Saturnidae) The Moon moth.

Chemical Experiments. (1) Passara manurial experiment.—This N.P.K. experiment was originally laid down by Dr. Eden in 1934. The first three cycles ran for 2 years and subsequently for 3 years. The 7th cycle ended in March 1953 and, as the original pruning date was altered from September to March on account of blister blight, the Plant Physiologist decided to rest the bushes till September-October in order to revert to the original programme laid down by Dr. Eden. The pruning consisted of a cut across to 20 inches in contrast to the rim-lung prune the bushes had hitherto received. The pruned

bushes were next sprayed with ' Limbux ' lime at the rate of 2 cwt. per acre to eliminate moss and stimulate bud-break. The results of the experiment are referred to in a report of the Plant Physiologist.

(2) Trace element experiment.—This experiment was laid down by Dr. Haworth in 1951. When the tea failed to respond to any of the nutrients, applied as sprays before the field came into plucking, the experiment was suspended in March 1952. In January, 1953 weekly pluckings were resumed. The originally treated plots next received three applications of a 0.5 per cent. spray of zinc sulphate at intervals of six weeks. This treatment too has so far not shown any results.

(3) Sulphur taint experiment.—A sulphur taint experiment was laid down in June on Gonakelle using Spersul, Thiovit, colloidal sulphur and lime sulphur.

Arboretum.—An arboretum was opened during the year when a piece of land, below the laboratory, a little less than half an acre in extent was cleared for the purpose.

In this garden it is proposed to establish representatives of all trees associated with the tea industry i.e. trees suitable for shade, windbreaks and fuel.

With the co-operation of the Department of Agriculture and the Forest Department all new botanical importations to the Island will also be tried out with a view to ascertaining their suitability for establishment on tea estates in this part of Uva.

REPORT OF THE ENGINEERING DEPARTMENT FOR THE YEAR 1953

General.—The Engineer returned from leave early in May. While on leave he visited several manufacturers of crop protection equipment and discussed various problems with their representatives.

A motor-mechanic and fitter-welder were engaged in the latter half of the year.

Buildings, Fixed Plant and Machinery.—The usual maintenance work was carried out on the Institute's and Estate's buildings and machinery.

(1) Quarters.—A new set of servants' quarters was built.

(2) Factory.—The factory was completely renovated and all the machinery painted.

A small air-conditioned withering-unit was constructed in the first loft for experiments by the Technologist.

(3) Workshop.—No new plant was installed, but consideration is being given to the purchase of an electric welding set next year, to reduce time and costs of much of the repair work.

An accurate costing system was introduced whereby all details of materials and labour are entered in job cards and costed by the Tea Research Institute Office.

(4) Garage.—The maintenance and servicing of all the Institute's vehicles was carried out in the newly built garage.

(5) Electricity supply.—The change from D.C. to A.C. was completed. The new plant is operating satisfactorily and costs were reduced to Rs. 24, 785 from the 1952 figure of Rs. 44,026, a saving of Rs. 19,241. Meters have been installed throughout the Institute, and detailed records of electricity consumption are now kept.

(6) Water supply.—The effective filtration rate of the existing plant (1,200 gallons per hour) is insufficient for requirements during the dry weather. Improvements were made to the plant, and all tank levels were checked with a view to increasing the supply in the future.

Crop Protection.—Tests on old and new machinery were carried out.

(1) Dusting equipment.—Modifications and additions to dusting equipment on the market were tested, and reports made.

(2) Spraying equipment.—A mobile power-operated charging unit and water carrier to serve St. Coombs estate sprayers was completed. This unit should save considerable time and labour as compared with the hand-operated charge pumps now in use. Details of the machine will be published in a future *Tea Quarterly*.

(3) Duiker mist-blower.—Modifications were made to the fan drives of this machine, and little or no trouble has since been experienced with their running. One of the Institute's apprentices, who was loaned to Mr. Van Bemmel in 1952, has been responsible for the maintenance of machines out on trial.

(4) Fibre-glass. knapsack pressure retaining type pneumatic sprayer. This is an interesting new development by Mr. E. J. Bals of Micron Sprayers, Ltd. The containers are constructed of glass mat bonded with resin, very light in weight i.e. 10½ lb. One container was charged with excess air and liquid after disconnecting the safety device, and pin holes appeared, thereby releasing the pressure, unlike a metal container which would have exploded. Further modifications and tests are necessary, however, before this machine could be considered for commercial purposes here.

(5) 'mysto' Pressure-retaining type pneumatic knapsack sprayer and charge pump.—These machines are manufactured by Messrs. W. T. French & Son, Ltd., Birmingham, and they are fortunate to have as their Technical Adviser Mr. A. C. Tunstall who is well aware of spraying equipment requirements for the East, having been a member of the staff of a research station in India for many years. The knapsack container incorporates a safety device and a pressure stabilizing valve and the charge pump is well constructed and robust. It is of interest to note that the packing cases for shipment abroad are stoutly constructed and designed in such a way that these can be used for subsequent storage of the machines, and, in cases where a lorry is used to transport the equipment to the field, the cases containing the sprayers and pump can be loaded directly on to the lorry.

(6) 'express 1' Battery sprayer and 'nue rapid' charge pump.—These machines, manufactured in Western Germany, are comparable with the other machines on the market. The knapsack tested, however, had a liquid capacity of 13 litres. A knapsack with a liquid capacity of 9 litres, which will be more suited to local conditions, is expected in the near future.

(7) Mini-micron sprayer.—This is the smallest model in the range of Micron sprayers. The newly designed rotary atomiser is a distinct advance on previous atomisers tested. Field tests with this machine are still in progress and it is too early yet to pronounce on the suitability of the machine for protection of tea against blister blight.

J. LANDRETH,
Engineer.

REPORT OF THE SCIENTIFIC OFFICER, LOW-COUNTRY SUB-STATION FOR THE YEAR 1953

General.—Mr. T. E. Walter was away on furlough from March to November, during which time the station was placed on a care and maintenance basis in the hands of Mr. F. P. Jayawardene.

Two addresses were given during the year—at the Tenth Biennial Conference, and at a meeting of the Southern Province Planters' Association.

Field Experiments.—The routine upkeep of the experiments in progress was maintained : owing to the absence of the Scientific Officer only two new investigations were begun.

(1) V. P. Experiments, vogan estate.—Planting up of the 4 acre block of Iddagodda Division, leased to the Tea Research Institute, continued, the failure of the S.W. monsoon providing a further unwelcome opportunity of finding the most drought resistant clones. By the end of the year ample amounts of clonal material were coming forward from our multiplication plots, the stock in hand in the nurseries amounting to some 20,000 cuttings.

(2) New experiments.—Both the new experiments initiated during the year were concerned with several aspects of the problem of shade in the low-country. In the first some preliminary tests were carried out to compare the effect of heavy shade with that of sunlight on quality, a subject which is still under investigation. The second consisted of a long-term experiment dealing with the effect of *Albizzia moluccana* as a shade tree in the wet zone of the low-country, where its extremely rapid growth raises doubts as to its suitability on the grounds that it may take more out of tea soil than it puts back. A shade tree layout on a new clearing has accordingly been designed to compare the effects on yields of this tree, grown under various systems of management, with those of *Grevillea robusta.*

We are indebted to the management of Messrs. James Finlay's estates for granting us facilities for these experiments, and our thanks are due to the superintendents of Alupolla and Galbode estates for their co-operation.

T. E. WALTER,
Scientific Officer.

REPORT OF THE OFFICER-IN-CHARGE SMALL HOLDINGS ADVISORY SERVICE FOR THE YEAR 1953

General.—A vacancy, created by the resignation late in 1952 of one of the Tea Instructors, was filled in April. From that time the Service had its full complement of staff, and more intensive work became possible in the four chief tea-growing provinces, Central, Southern, Sabaragamuwa and Uva.

A staff conference was held at headquarters at the end of December. The year's work was reviewed and a programme for 1954 discussed. The importance of establishing the fullest liaison with the newly established Producer Co-operative Societies (see below) was stressed.

Advisory.—The volume of correspondence and the number of visits greatly increased in 1953 as the following figures show :—

	1953	1952
Letters received	7,483	1,465
Letters despatched	10,277	2,452
Visits made	9,428	6,406

Propaganda.—(1) Demonstration plots.—The value of holdings, consistently well cultivated by keen smallholders, as demonstration plots has been amply proved and by the end of 1953 each officer had succeeded in establishing more than twenty such plots in his area. The owners of these plots were rewarded for their efforts, and given further encouragement, by the free issue of manure, seed, fungicide and equipment. During the year these issues amounted to :—

Manure	35 cwt.
Tea Seed	3 maunds
Green manure seed	38 lb.
Perenox	10 lb.
Sprayers	7
Seccateurs	4

(2) Loans.—A further form of assistance administered by the Service has been the provision of manure and tea-seed by loans. Under this scheme the smallholder puts up one-third of the cost of the manure and seed in advance, and pays for the balance over the following three months. The demand for this assistance increased in 1953. Comparative figures are :—

	1953	1952
Manure	147 tons	14 tons
Tea seed	103 maunds	75 maunds

The total value of the 1953 distribution is approximately Rs. 100,000 and of the Service's loan, therefore, Rs. 66,000. At the end of the year outstanding loans were Rs. 13,000 only, and little difficulty is anticipated in recovering this. However, as some safeguard against bad debts, one half of the 5 per cent. discount allowed by the suppliers has been held by the Service. With the establishment of Producer Co-operative Societies, the need for this

type of loan scheme will cease, and money remaining in this reserve fund after the settlement of bad debts will be used for further propaganda work.

(3) FIELD DAYS.—Several field days were held in the different provinces, at which many aspects of tea cultivation were demonstrated and discussed. These occasions have proved a useful means of propaganda.

(4) AGRI-HORTICULTURAL SHOWS.—Two shows were held during the year, one at Nuwara Eliya, the other at Hanguranketa. Both of these were a great success.

(5) CINEMA UNIT.—The United Kingdom and United States Embassies and the Government Information Department again loaned films of educational value. Ninety-one shows were given in the following areas :—

	1953	1952
Southern Province	29	33
Central Province	57	30
Uva and Sabaragamuwa	5	3
	91	66

In every case the films drew large audiences, and the unit has proved itself a most valuable aid to extension work.

Co-operative Societies.—During the year Government established the Smallholdings Advisory Board to make recommendations on the formation of Producer Co-operative Societies. Two main conditions were laid down as prerequisites for the formation of a society.

(*a*) A minimum area of 500 acres
(*b*) Tea to be the sole cash crop

The societies operate under the Co-operative Ordinance. Government agreed to the following forms of assistance to the societies :—

(*a*) A subsidy of one-third of the value of manure to a maximum of 4 cwt. per acre.
(*b*) A grant of Rs. 20/- per acre for soil conservation. This money is given only after the satisfactory completion of such work.
(*c*) A loan of Rs. 30/- per acre at 4 per cent. interest, repayable in one year.

Acknowledgments.—The help and co-operation received from the Embassies of the United Kingdom and United States and from the Government Information Department, in connection with the supply of films, is gratefully acknowledged.

R. L. ILLANKOON,
Officer-in-Charge.

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